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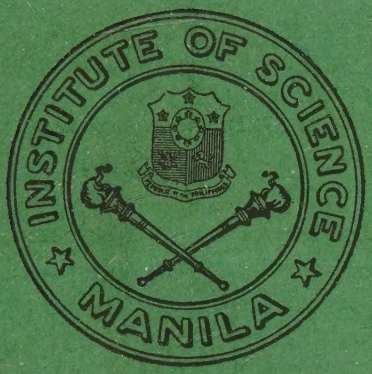

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READJUSTMENTS IN THE NOMENCLATURE OF PHILIPPINE EUGENIA SPECIES

By E. D. MERRILL
Of Harvard University

Eugenia Linn. has been treated by most authors, following the Bentham-Hooked f. interpretation, General Plantarum 1 (1865) 718, as a collective genus enormously developed in the total number of species in the tropical and subtropical parts of both hemispheres. The number of binomials actually published under this generic name approximates 2,600 and new ones are constantly being proposed. This of course, does not mean that there are now 2,600 distinct species in this protean genus (or rather, in the current interpretation of it *sensu latiore*), for a complicated synonymy is involved. Many proposed species have been reduced as synonyms of earlier described ones. However, the number of distinct species is very large, and the vast number of already published binomials clearly indicates to systematists the difficulties which any student may be expected to encounter, whether he be a widely experienced individual or merely a beginner, and whether he be concerned with generic or merely with specific limits.

Most authors naturally accept the weight of authority, and thus it is that those who still elect to follow the Bentham-Hooker f. system accept *Eugenia* Linn. as they interpreted it. These two eminent botanists actually reduced to *Eugenia* approximately 37 genera that had been proposed by this or that author for this or that Old World or New World group. With their wide concept the number of generic synonyms would now

be in excess of 40 if the published reductions of *Aphanomyrtus* Miq. (*Pseudoeugenia* Scort.), *Paraeugenia* Turrill, and *Tetraeugenia* Merr. to *Syzygium* Gaertn. be accepted, for the latter in the Bentham-Hooker f. concept is in turn a synonym of *Eugenia* Linn.

Niedenzu, in his treatment of the Myrtaceae, Engler and Prantl, Nat. Pflanzenfam. 3(7) (1891) 78–86, restricted *Eugenia* Linn. as almost wholly limited to the tropical American species. He placed the great bulk of the Old World *Eugenia* species in *Syzygium* Gaertn. and *Jambosa* DC., neither of these having any representatives in the New World except as this or that species has been deliberately introduced. The American *Eugenia* Linn. was subdivided into two subgenera, twelve sections, and three subsections, and the only admitted Old World species was a small group that he designated as subgen. *Eueugenia*, sect. *Jossinia*.

Here and there modern authors concerned with Old World species have accepted *Syzygium* Gaertn., *Jambosa* DC., and at least one (Diels) also *Jossinia* Commers. Few in recent years have gone beyond this limited segregation, although Guillaumin in 1939 recognized for the New Caledonian representatives of the group, *Eugenia* Linn. about 30 species (all apparently belonging in *Jossinia*), *Jambosa* DC., 8 species, *Syzygium* Gaertn., 27 species, and finally *Caryophyllus* Linn., 14 species. I have been content to retain the *Caryophyllus* species under *Syzygium* Gaertn., as have other modern authors who have accepted this or that proposed generic segregate. He also recognized *Acicalyptus* A. Gray, which Dr. Perry and I, correctly we believe, placed as a synonym of *Cleistocalyx* Blume.[1]

In our studies of this complex group, covering the genera and species of the Old World tropics, with special attention to those of China, Indo-China, Borneo, New Guinea, Fiji, and now the Philippines, we have been content to recognize as worthy of generic rank, one very large Old World genus, *Syzygium* Gaertn. (including *Jambosa* DC. and *Caryophyllus* Linn.), and several much smaller groups, *Cleistocalyx* Blume (including *Acicalyptus* A. Gray), *Acmena* DC., and now, following Diels, I recognize *Jossinia* Commerson. In his extensive studies of this *Eugenia* complex for the species of New Guinea, the Solomon Islands and Micronesia, Diels also recognized *Jambosa* DC. as worthy of generic status coordinate with *Syzygium* Gaertn. While it is admitted that the extreme forms

[1] Guillaumin, A. Bull Soc. Bot. France 85 (1938) 626–655.

of the *Jambosa* assemblage, with medium to large flowers, spreading petals, and large calyx lobes do appear to be sufficiently distinct from the normally small flowered *Syzygium* species wherein the calyx lobes are usually short or very short, and the concave petals are closely imbricate, sometimes even cohering, and usually falling as a sort of calyptra, rather than spreading, we have felt that there are too many intermediate forms to warrant the acceptance of *Jambosa* DC., as a distinct genus. Although I still prefer to retain *Jambosa* DC. as a synonym of *Syzygium* Gaertn., perhaps after all it is as distinct from *Syzygium* Gaertn., as is *Syzygium* Gaertn. from *Eugenia* Linn., or as are *Cleistocalyx* Blume, *Acmena* DC., *Jossinia* Commers., and even *Caryophyllus* Linn., *Aphanomyrtus* Miq. (*Pseudoeugenia* Scort.), *Tetraeugenia* Meer., and *Paraeugenia* Turrill, from *Syzygium* Gaertn.

In addition to the Bornean study of 156 species of 1939 referred to below under *Syzygium* there are two recent detailed studies of this group for parts of the Malaysian region, first the Amshoff [2] treatment of the Javan species for which island she recognized *Eugenia* Linn., with one introduced species (*Eugenia uniflora* Linn.), *Cleistocalyx* Blume, with one species, *Aphanomyrtus* Miq., with one species, *Acmena* DC., with two species, and *Syzygium* Gaertn. (including *Jambosa* DC.), with fifty species. The contrasting one is Henderson's [3] detailed consideration of the species of the Malay Peninsula, in which he recognized 138 species, all retained under *Eugenia* Linn. *sensu latissimo*. His major divisions for the genus for the Malay Peninsula are four sections, § *Syzygium,* which for key purposes is subdivided into five unnamed groups covering 134 species and various varieties; § *Acmena,* with one species, § *Cleistocalyx,* with one species and § *Fissicalyx,* a new section with two species. This is strictly the conventional Bentham-Hooker f. concept, which for practical purposes is really much simpler than any other system yet proposed.

It may be argued that inter-relationships in groups above the species limits, such as the genus, may as readily be indicated by the acceptance of a broad generic concept and with the recognition of subgenera, sections, and other minor categories. In any case it is quite evident that there is, as yet, no approach to

[2] Amshoff, G. J. H. Myrtaceae, in Backer, C. A. Beknopte Flora van Java Afl. 4B (1) (1944) 1–39; Blumea 5 (1945) 495–501.

[3] Henderson, M. R. The genus Eugenia (Myrtaceae) in Malaya. Gard. Bull. Singapore 12 (1949) 1–293, *fig. 1–54.*

unanimity among those who have studied this group as to what constitutes a genus, or as to generic limits.

I am by no means satisfied in this study that all of my conclusions, as to the limits of this or that species, are correct, that all of the indicated reductions will stand the test of time, or that all of the recognized species will prove to be valid ones. I have merely done the best that I could with the material at present available to me. The deliberate burning of the Manila herbarium (Philippine National Herbarium), February 9, 1945, by the Japanese in the course of the fighting which resulted in the re-occupation of the city of Manila, proved to be a tremendous handicap, for the holotypes of some thousands of species described in Manila from 1904 to 1940 were thus lost. I have, accordingly, been obliged to rely on distributed duplicates and on published descriptions. Distributed duplicates are by no means always correctly named, although in a high percentage of those sent out from Manila the names are correct. In the case of several species I have been unable to locate authentically named specimens, and have had to depend on the published descriptions.

In the course of this study I have depended very largely on the material preserved in the Gray Herbarium and in the herbarium of the Arnold Arboretum, supplemented by the loan of all the unnamed Philippine specimens in the United States National Herbarium, the British Museum of Natural History, and the Royal Botanic Gardens, Kew. Representatives of selected species were also borrowed from the first of the above institutions. The receipt of the study set of the collections made under the auspices of the Philippine National Museum has been of very material assistance; it was my attempt to name this material that induced me to turn my attention to the Philippine representatives of this *Eugenia* complex. I am greatly indebted to those in authority who approved my requests for loans, to Mr. M. R. Henderson, Director of the Botanic Garden at Singapore, who very courteously provided some representation of nearly all of the species of the Malay Peninsula which were not already represented in our collections, and to Dr. Eduardo Quisumbing, for sending to me a most important set of duplicates of the current collections made since 1945. A very high percentage of all the described Philippine species of *Syzygium*, including very many holotypes and isotypes, are fortunately represented in the collection available to me for study.

The types of the 19 new species described in this paper are, unless otherwise stated, deposited in the herbarium of the Arnold Arboretum.

XANTHOMYRTUS Diels

XANTHOMYRTUS DIPLYCOSIFOLIA (C. B. Rob.) Merr.

Xanthomyrtus diplycosifolia (C. B. Rob.) Merr., Philip. Jour. Sci. 30 (1926) 415.

Eugenia diplycosifolia C. B. Bot. Rob., op. cit. 4C (1909) 347; Merr., Enum. 3 (1923) 165.

Eugenia aurea Elm., Leafl. Philip. Bot. 4 (1912) 1400; Merr. op. cit. 158, *syn. nov.*

Xanthomyrmex aureus Merr., Philip. Jour. Sci. 30 (1923) 415, *syn. nov.*

Higher mountains of the Philippines from northern Luzon to Negros and Mindanao. Endemic. With seventeen individual collections now available for examination, including nine recent ones from Mount Polis in northern Luzon and the mountains of Mindanao (*P. N. H. 7795, 7914 Celestino, 1049, 1051, 1064, 1569 Edaño, 10780, 10809 Mendoza* and *Convocar, 9985 Sulit,* I conclude that a single species is represented.

This Philippine species is apparently most closely allied to the Papuan *Xanthomyrtus fasciculata* Diels. The genus is essentially a Papuan one with nineteen species now known from New Guinea, three in Borneo, two in New Caledonia, and apparently one in northeastern Australia. *Xanthomyrtus* Diels belongs in the Myrtinae, not in the Eugeniinae.

EUGENIA Linnaeus

In a strict sense there is only one species of this genus known from the Philippines, this being the introduced *Eugenia uniflora* Linn. (*E. michelii* Lam.), native of Brazil. It is known as "pitanga," its Brazilian name, and as the "Cayenne cherry." It was introduced into Ceylon and India by the Portuguese at an early date, and from Goa it was introduced into Italy. It was first illustrated in European literature by Tilli in 1723 and a little later by Micheli in 1729, from specimens cultivated in Italian gardens. The references to Tilli and to Micheli are included in the original Linnaean consideration of the species, and Linnaeus saw the Flora Zeylanica specimen. While it is true that Linnaeus in 1753 included in *Eugenia* two species which belong in *Syzygium* Gaertner (including *Jambosa* DC.) and two species of the lecythidaceous genus *Barringtonia* Forst., his generic description from the first edition of his Genera Plantarum (1737) to the last one issued by him was based wholly on Micheli. and he cites Micheli as the author of the

genus, as well as is the case in all later editions of the Genera Plantarum by other authors. It was, hence, entirely logical that *Eugenia uniflora* Linn. should have been selected as the type or standard species of the genus, rather than either of the Old World species of *Syzygium* (*Eugenia malaccensis* Linn. and *E. jambos* Linn.) included in the first edition of the Species Plantarum.

Berg, Linnaea 27 (1854) 309, proposed and described the genus *Stenocalyx* Berg, publishing under it 41 binomials; but here, were one to select a type or standard species, it should logically be *stenocalyx michelii* Berg = *Eugenia micheli* Lam. = *Eugenia uniflora* Linn. Thus *Stenocalyx* Berg is an exact synonym of the earlier *Eugenia* Linnaeus, for the benefit of those who would segregate minor generic groups from the now unwieldy *Eugenia* complex. Most of the numerous Philippine *Eugenia* species are now referred to *Syzygium* Gaertner, a few to other genera as indicated below.

EUGENIA UNIFLORA Linn.

Eugenia uniflora Linn., Sp. Pl. (1753) 471; Merr. and Perr. Jour. Arnold Arb. 19 (1938) 203.

Eugenia michelii Lam., Encycl. 3 (1789) 206.

Stenocalyx michelii Berg, Linnaea 27 (1854) 310, *cum syn.*

Eugenia decidua Merr., Philip. Jour. Sci. 9C (1914) 121, (type from Guam.

LUZON, Benguet Subprovince, Mount Santo Tomas, *P. N. H. 2178 Quisumbing,* Feb. 10, 1948, "grasslands on plateau, alt. 2,200 m."; Laguna Province, College of Agriculture, planted, *P. N. H. 8132 Sulit,* with the Brazilian name "pitanga."

As noted above this species was introduced into the Old World at an early date by the Portuguese in connection with their transmission of economic plants from Brazil to India, and vice versa, in the early colonial period. I have no record as to when the species was introduced into the Philippines; I had seen no specimens up to 1940 from the islands. If the field note on the above cited specimen is correct, it is apparent that the species has now become naturalized.

JOSSINIA Commerson ex De Candolle

Following my present inclination I have disposed of most of the numerous described Philippine species of *Eugenia* by transferring them to *Syzygium* Gaertner, with a few placed in *Acmena, Cleistocalyx,* and *Xanthomyrtus.* There was a small residue which, for a time, I was disposed to retain in *Eugenia*

Linnaeus, because this small *Jossinia* group resembled certain of the American *Eugenia* species much more closely than they did the Old World representatives of *Syzygium*. After due consideration I decided to follow Diels in this matter and to recognize *Jossinia* Commerson ex De Candolle as worthy of generic rank for this particular group.

The genus was first characterized by De Candolle (who accepted Commerson's name), Prodr. 3(1828) 237 (err. typ. 337), to take seven species from the Mascarene Islands and one from Madagascar. Blume later accepted the name, Mus. Bot. Lugd.-Bat. 1 (1849) 119–125, increased the number of species to seventeen, and extended the generic range to India, Celebes, the Moluccas, and New Guinea. Whether considered as a proper genus or as a subdivision of *Eugenia*, the range of the group is considerably wider than has hitherto been indicated, as representatives occur in tropical Africa, northeastern Australia, and throughout the Pacific region eastward to Hawaii, Tahiti, and Marquisas Islands. Thirty nine binominals have been published under this generic name. Those who have followed the Bentham-Hooker f. concept of *Eugenia* as a collective group and Niedenzu's somewhat narrower interpretation (excluding the *Syzygium-Jambosa* complex), naturally reduced *Jossinia* to *Eugenia*. In recent times Diels reinstated *Jossinia* for several species from New Guinea, Moluccas, Aru, Key, Caroline, and the Marianas Islands, Bot. Jahrb. 56 (1921) 531, op. cit. 57 (1922) 376–377, Jour. Arnold Arb. 10 (1929) 82. In 1921 he briefly discussed *Jossinia* as a genus, as follows:

> Den übrigen Formenkreisen der papuasischen *Eugeniinae* gegenüber muss *Jossinia* im Sinne Blumes getrennt behalten werden. Sie ist davon verschieden durch den Blütenstand (Einzelblüten in den Achseln kleiner Bracteen an getauchten oder auswachsenden Kurztreiben), durch das kurze Receptaculum mit grossen Kelchlappen und diskusartig erweiterem, die Staubblätter tragendem Scheitel, sowie durch die in der Knospe schlängelig eingekrümmten, nicht ± scharf geknickten Staubblätter. *Jossinia* scheint näher verwandt zu sein mit amerikanischen Formenkreisen als mit *Jambosa* und *Syzygium*."

A. Gray, Wilkes U. S. Explor. Exped. Bot. 1 (1854) 509, concerned himself with this *Eugenia* complex, stated that at first he was strongly disposed to accept the segregates *Jambosa*, *Syzygium* and *Acmena* as defined by De Candolle. But after considering also the proposals of Blume in *Gelpkea*, *Strongylocalyx*, *Jambosa*, *Clavimyrtus*, *Microjambosa*, and *Jossinia*, he decided that it would be necessary either to increase the number of proposed genera, or to retain *Eugenia* in the conventional wide

sense that most authors have since followed; he chose the latter course. He noted that *Jossinia,* as defined by Blume, would fall in *Eugenia* except for the thick testa of the seed. He mentioned Wight's statement that *Jossinia* seeds have foliaceous cotyledons, but called attention to the fact that the seeds of the original *Jossinia* species do not appear to be known. I have not been able to examine the Mascarene specimens on which the original description of the genus was based. In accepting *Jossinia* I have assumed that the group, as characterized by Blume in 1849, is the same as that originally defined by De Candolle in 1828; but it should be noted that Diels specifically mentioned that he accepted the group as defined by Blume. I note in passing that when Niedenzu accepted and defined *Jossinia* as a section of the subgenus *Eugenia* his definition "Blüthenstand endstandig, racemos, beblattert" is not good, for in the typical species the flowers are solitary, paired, or fascicled, mostly axillary, sometimes terminal or subterminal. All of the species which I here consider have axillary, sometimes subterminal, solitary, paired, or fascicled flowers, these pedicelled or sessile. In none of the Philippine species is the inflorescence compound and branched as is the case in most of the *Syzygium* species; there are in the *Jossinia* range various species with racemose flowers. In addition to the often cushion-like disk and the large calyx lobes which are free to the base, i.e., with no extension of the tube above the ovary, as is the case in *Syzygium,* the pedicels and sepals are often sparingly pubescent, while with the exception of a very few *Syzygium* species, that large group is characteristically entirely glabrous. The Philippine representatives of *Jossinia* are:

JOSSINIA AHERNIANA (C. B. Rob.) comb. nov.

Eugenia aherniana C. B. Rob., Philip. Jour. Sci. 4C (1909) 344; Merr., Enum. 3 (1923) 157.

Eugenia melastomoides Elm., Leafl. Philip. Bot. 4 (1912) 1429; Merr., op. cit. 171, *syn. nov.*

This is one of the most widely distributed Philippine species extending from northern Luzon to southern Mindanao, and is now also known from Celebes. Twenty-two individual collections are now available to me, which for the most part represent distributed duplicates of early collections all correctly named; two recent collections are *P.N.H. 9568 Navarro, 9612 Mabesa* from Mount Maquiling, Laguna Province, Luzon. I can detect no characters by which *Eugenia melastomoides* Elm. may be distinguished from the form Robinson characterized and do not

hesitate in reducing it to synonymy. The one Celebes collection available to me is *Netherl. For. Serv. 17160.*

JOSSINIA BRACHIPODA sp. nov.

Arbor parva, floribus exceptis glabra, ramis ramulisque pallidis, teretibus, ultimis 1–1.5 mm. diametro; foliis subellipticis vel elliptico-obovatis, 4–5.5 cm. longis, 2–3 cm. latis, coriaceis, breviter petiolatis, rotundatis vel latissime breviter rotundato-acuminatis, basi acutis, margine leviter revolutis, supra subolivaceis, subtus pallidis, utrinque obscurissime puncticulatis, vix nitidis nervis primariis utrinque circiter 7, gracilibus, inconspicuis, in venam intramarginalem 1 mm. a margine confluentibus, secundariis reticulisque obscuris; petiolo 2–3 mm. longo; floribus axillaribus, solitariis vel binis, sessilibus vel subsessilibus, plus minusve pubescentibus, saltem 2 cm. diametro (petalis ignotis), calycibus extus leviter pubescentibus, tubo lato, circiter 3 mm. longo, sursum ampliato, sepalis 4, glanduloso-punctatis, extus consperse pubescentibus, liberis, suborbiculari-ovatis, rotundatis, plus minusve concavis, binis circiter 5 mm. longis et 6 mm. latis, alteris 6 mm. longis et 7 mm. latis; petalis ignotis; staminibus numerosis, filamentis 1 cm. longis; stylo 1 cm. longo; disco incrassato, leviter pubescenti, 6 mm. diametro.

MINDANAO, District of Zamboanga, Santa Maria, *Bur. Sci. 16403 Reillo,* Sept.–Oct., 1912, type in the Gray Herbarium, isotypes in the U. S. National and British Museum herbaria.

Among most of the Philippine species this is distinguished by its sessile flowers, and while several of the other described Philippine species do have sessile flowers, they differ totally in their vegetative characters; among these it is apparently most closely allied to *Eugenia sargentii* Merr.

JOSSINIA HETEROPHYLLA (Merr.) comb. nov.

Garcinia heterophylla Merr., Philip. Jour. Sci. 12C (1917) 285, Enum. 3 (1923) 84.

LUZON, Nueva Ecija Province, *Bur. Sci. 26457 Ramos* and *Edaño.* Known only from the type collection, my attention having been called to my original error by Mr. H. K. Airy Shaw, Royal Botanic Gardens, Kew.

JOSSINIA KAMELII (Merr.) comb. nov.

Eugenia kamelii Merr., Philip. Jour. Sci. 10C (1915) 219; Enum. 3 (1923) 168.

A *Jossinia* with unusually large leaves. The species is still known only from the original collection, *Bur. Sci. 17539 Ramos,* from Samar, there being an excellent specimen of this in the U. S. National Herbarium. Its alliance is clearly with *Eugenia tulanan* Merr.

JOSSINIA LOHERI (C. B. Rob.) comb. nov.

Eugenia loheri C. B. Rob., Philip. Jour. Sci. 4C (1909) 345; Merr., Enum. 3 (1923) 169.

A typical *Jossinia*, still known only from the two original collections, *Cuming 1388*, *Loher 2475*, from Nueva Ecija and Pampanga provinces, Luzon.

JOSSINIA MONTALBANICA (Merr.) comb. nov.

Eugenia montalbanica Merr., Philip. Jour. Sci. 30 (1926) 417.
Eugenia diospyrifolia Merr., op. cit. 27 (1925) 39, non Wall.

A species still known only from the three original collections on which it was based, all in fruit, *Loher 13307, 13328, 14879*, from the mountains back of Montalban, Rizal Province, Luzon. It is possible that when flowers become available some other generic disposition of this species may be indicated.

JOSSINIA PASACAENSIS (C. B. Rob.) comb. nov.

Eugenia pasacaensis C. B. Rob., Philip. Jour. Sci. 4C (1909) 346; Merr., Enum. 3 (1923) 173.

Known only from the type collection, *For. Bur. 10467 Curran*, from Pasacao, Camarines Province, Luzon. A typical *Jossinia*.

JOSSINIA SARGENTII (Merr.) comb. nov.

Eugenia sargentii Merr., Philip. Jour. Sci. 18 (1921) 290; Enum. 3 (1923) 177.

Cagayan, Zambales, Pampanga, Batangas, and Rizal provinces, Luzon, and with some doubt, Ticao Island. An additional collection to those previously cited is *Loher 12399* from Rizal Province, Luzon.

JOSSINIA TULANAN (Merr.) comb. nov.

Eugenia tulanan Merr., Philip. Jour. Sci. 11C (1916) 201; Enum. 3 (1923) 179.

Originally described from two Samar collections. I now refer here the following additional collections: LUZON, Rizal Province, *Bur. Sci. 29267, 29391 Ramos* and *Edaño* (erroneously distributed as representing *Eugenia vidaliana* Elm.); Tayabas (Quezon) Province, Casiguran, *Bur. Sci. 45439 Ramos* and *Edaño*. BOHOL, *Bur. Sci. 43087 Ramos* (distributed under an unpublished binomial derived from the name of the island). MINDANAO, Agusan Province, Diuata Mountains, *Bur. Sci. 83730 Ramos* and *Convocar*.

[4] See Merrill, E. D. and L. M. Perry. A synopsis of Acmena DC., a valid genus of the Myrtaceae. Jour. Arnold Arb. 19 (1938) 1–20.

ACMENA De Candolle[4]

ACMENA ACUMINATISSIMA (Blume) Merr. and Perr.

Acmena acuminatissima (Blume) Merr. and Perr., Jour. Arnold Arb. 19 (1938) 12; Amshoff in Backer, Beknopte Fl. Java 4 B I Myrt. (1944) 8.

Myrtus acuminatissima Blume, Bijdr. (1826) 1088.
Syzygium acuminatissimum DC., Prodr. 3 (1828) 361.
Eugenia acuminatissima Kurz, Prel. Rep. Veg. Pegu App. A. 63 (1875) 51; Jour. As. Soc. Bengal 46 2 (1877) 67, et auct, plur., non Miq. (1847), nec Berg (1857–59).
Eugenia cumingiana Vidal, Phan. Cuming. Philip. (1885) 173; Henders. Gard. Bull. Singapore 12 (1949) 260 *fig. 62* and *fig. 5* (p. 9).
Eugenia saligna C. B. Rob., Philip. Jour. Sci. 4C (1909) 392; Merr., Enum. 3 (1923) 176. non *Jambosa saligna* Miq.
Syzygium cumingianum Gibbs, Jour. Linn. Soc. Bot. 42 (1914) 76.
Eugenia attenuatifolia Merr., Philip. Jour. Sci. 18 (1921) 299.
Eugenia eucaudata Elm., in Merr. Enum. 3 (1923) 176, *nom.* in syn.; Elm., Leafl. Philip. Bot. 10 (1939) 3808, *nom.* "is *Eugenia saligna* (Miq.) C. B. Rob."

This is a common and widely distributed species, occurring not only throughout the Philippines, but extending from Tenasserim and the Andaman Islands to southern China (*Eugenia subdecurrens* Merr. and Chun. Sunyat. 2 (1935) 289) through the Malay Peninsula to Sumatra, Java, Borneo, Timor and the Solomon Islands. It is the only representative of the genus known from the Philippines. Henderson, Gard. Bull. Singapore 12 (1949) 260, *figs. 51A, 52,* accepts the name *Eugenia cumingiana* Vidal, which is correct if the species be considered to belong in *Eugenia* Linn. He cites the Koorders and Valeton very excellent figure of *Eugenia acuminatissima* Kurz, Atlas Baumart. Java 3 (1915) *fig. 506,* as representing the species, but for some reason, unaccountable to me, says, "excl. fruit"; and yet the fruit as depicted by them illustrates one of the striking characters of the genus *Acmena,* which holds for all of the fruits of the species that I have examined, i.e., the peculiarly ruminate character which Henderson describes, as did Koorders and Valeton. In his own, *fig. 51A,* he did not show this striking character, probably for the reason that he had depicted it in the germinating seed, *fig. 5b,* p. 9. If any group is worthy of segregation from *Eugenia* Linn., *sensu lat.,* as a genus, I am of the opinion that the ruminate seed characters plus the anthers opening by terminal slits, which Henderson does show, make this group one well worthy of recognition. I see no reason for eliminating the fruit in the Koorders and Valeton illustration.

CLEISTOCALYX Blume[5]

The one character by which this genus is very easily distinguished is that, as in the large American genus *Calyptranthes* Swartz (1788), there is no evidence of free sepals, that part of the calyx above the tube being entirely fused into a circumscissile calyptra, which falls as a whole; in the material that I have examined the fusion is so complete that there is no evidence of calyx segments, quite as in *Calyptranthes* Swartz. It seems to me that it would be just as logical to reduce the large American genus *Calyptranthes* Swartz to one of its allied genera, which no systematist, as far as I am aware, has ever even suggested, as it would be to reduce *Cleistocalyx* Blume to *Eugenia* Linn. as Bentham and Hooker f. and Niedenzu did, and which Henderson accepted, Gard. Bull. Singapore **12** (1949) 264, although the latter did recognize *Cleistocalyx* Blume a section of *Eugenia* Linn. coordinate with *Syzygium* Gaertner, *Acmena* DC. and with his own sectional segregate *Fissicalyx* Henders.

As a matter of fact Blanco in 1837 and in 1845, in considering one of the Philippine species of *Cleistocalyx*, placed it in *Calyptranthes* Swartz, as did Hance in 1851–52, when he described *Calyptranthes mangiferifolia* Hance [*Cleistocalyx operculatus* (Roxb.) Merr. and Perr.] from Macao specimens, thinking that what he had was a plant introduced by the Portuguese from tropical America.

Sometimes, perhaps, "the wish is the father of the thought" among those who may object to the subdivision of large and cumbersome genera, those who advocate this procedure, and those who accept various subdivisions of *Eugenia* Linn. and have even further subdivided *Syzygium* Gaertn. Thus Guillaumin in his treatment of the Myrtaceae of New Caledonia, Bull. Soc. Bot. France **85** (1938) 652, objects to our reduction of *Acicalyptus* A. Gray to *Cleistocalyx* Blume, assuming that we misinterpreted Blume's genus because in his description Blume definitely stated, regarding the calyx, "limbo supero, primum clauso, sub anthesi in lobos 4 v. 5 irregulares longitudi-

[5] See Merrill, E. D. and L. M. Perry. Reinstatement and revision of Cleistocalyx Blume (Including Acicalyptus A. Gray), a valid genus of the Myrtaceae. Jour. Arnold Arb. **18** (1937) 322–343, *pl. 215*.

naliter fisso, deciduo." But neither Blume's actual specimens nor his *fig. 56* show such characters, but rather a strictly entire circumscissile deciduous calyptra, as do all of the other species we have placed in *Cleistocalyx*. It is suspected that the "lobos 4 v. 5 irregulares" etc. was added by Blume to accommodate *Cleistocalyx nervosus* Blume (*Eugenia nervosa* Lour.) which Blume knew only from the published description, which he misinterpreted, and which is a true *Syzygium* (*S. oblatum* Wall.; *Eugenia oblata* Roxb.) Morphologically the only difference that we can detect as between *Acicalyptus* A. Gray and *Cleistocalyx* Blume, is the more ligneous and elongated calyptras of the former as compared with the usually thinner and sometimes merely hemispheric ones of the latter. We interpret Blume's genus from the actual specimens on which the description was based, the "lobos 4 v. 5 irregulares longitudinaliter fisso" being nonexistent.

CLEISTOCALYX ARCUATINERVIUS (Merr.) Merr. and Perr.

Cleistocalyx arcuatinervius (Merr.) Merr. and Perr., Jour. Arnold Arb. **18** (1937) 333, *pl. 215, figs. 16–18.*

Eugenia arcuatinervia Merr., Philip. Jour. Sci. **1** Suppl. (1906) 104, Enum. **3** (1923) 158.

Eugenia sibulanensis Elm., Leafl. Philip. Bot. **10** (1939) 3808, *nom.*, "is *Eugenia arcuatinervia* Merr."

A species widely distributed in the Philippine forests, extending from northern Luzon to Mindanao. Some older but not previously cited collections and some recent ones are *Cuming 1275, 1325*, from Cagayan Province, Luzon, *Cuming 1710* from Samar, and *P. N. H. 8373 Sulit* from Laguna Province, Luzon.

CLEISTOCALYX OPERCULATUS (Roxb.) Merr. and Perr.

Cleistocalyx operculatus (Roxb.) Merr. and Perr., Jour. Arnold Arb. **18** (1937) 337, *pl. 215, figs. 41–48, cum. syn.*

Eugenia operculata Roxb., Hort. Beng. (1814) 37, *nomen nudum*, Fl. Ind. ed. 2 **2** (1832) 386; descr. Henders. Gard. Bull. Singapore **12** (1949) 265, *fig. 53, cum. syn.*

Syzygium nervosum DC., Prodr. **3** (1828) 260; Mém. Myrt. **42** (1842) *pl. 16*, non *Cleistocalyx nervosus* Blume.

Eugenia clausa C. B. Rob., Philip. Jour. Sci. **4C** (1909) 380; Merr., Enum. **3** (1923) 162, *cum. syn.*

This is a common and widely distributed species in the Philippines, and outside of the Archipelago is recorded from Burma to southeasthern China and Hainan (*Eugenia divaricatocymosa* Hay.; *Calyptranthes mangiferifolia* Hance), Indo-China, the Malay Peninsula, Sumatra, Java, Borneo, extending as far to the southeast as tropical Australia. Additional synonyms

are *Calyptranthes makal* sensu Blanco (1837), non Raeusch., *C. Syzygium* sensu Blanco (1845), non Sw., *Syzygium nodosum* and *S. angkolanum* Miq. (1855), *Eugenia holtzei* F. Muell. (1886), *Syzygium operculatum* Niedenz. (1893), *Eugenia holtzeana* F. Muell. (1899), and *Eugenia holteana* F. Muell. (1917).

Blume's description of the genus *Cleistocalyx* was based on an actual specimen, the type being *Cleistocalyx nitidus* Blume (*Jambosa nitida* Korth.) from Borneo. His other binomial, *C. nervosus* Blume, was published under a misapprehension, its basis being wholly the description of *Eugenia nervosa* Lour. Fl. Cochinch. (1790) 308, of which *Myrtus loureiri* Spreng. (1825) is an exact synonym. Out of curiosity I again checked Loureiro's description. It is definitely that of a *Syzygium* and it certainly applies to *Syzygium oblatum* Wall. (*Eugenia oblata* Roxb.). It should be noted that Loureiro's specific name was taken from the fruit, not from the leaf characters, for he indicates the fruit as "globosa, 1–pollicaria, nervosa," while Gagnepain in 1920 described it as "15–18 mm. de diam., strié en long," and Henderson in 1949 as 1.75 x 2 cm. "faintly vertically ridged." Loureiro's other characters apply sufficiently well. No other known Indo-China species conforms with Loureiro's description, and in *Eugenia* the binomial *E. nervosum* Lour. is valid and replaces *Eugenia oblata* Roxb., (1814, *nom.*, 1832, *descr.*). In *Syzygium* the specific name is invalidated by the totally different *S. nervosum* DC. (1828) which is a synonym of *Cleistocalyx operculatus* (Roxb.) Merr. and Perr. The somewhat earlier *Myrtus loureiri* Spreng. (1825) is not available as its publication was illegitimate.

Syzygium nervosum DC., Prodr. 3 (1828) 260, is in a different category, for it was a new name for *Eugenia operculata* Roxb. "Cat. Calc. p. 37 (v. s.)" and his descriptive data, with the significant phrase "calycibus integerrimis" was based on a duplicate he had received from Calcutta, and doubtless from Roxburgh himself. Apparently he proposed the new binomial because he realized that the specific name Roxburgh had selected, although it applied beautifully to the species, did not apply to *Syzygium* as De Candolle himself delimited it; and yet in his brief species description he did inadequately indicate its striking calyx character. However, this discussion is beside the point, for as shown above the specific name *nervosum* was published in *Cleistocalyx* through a misconception, and although De Candolle did publish the first description of the

species here considered, the beautifully descriptive name selected by Roxburgh and first appearing in 1814 as a *nomen nudum,* but not actually described by Roxburgh until 1832, stands, both in *Eugenia* and in *Cleistocalyx;* in *Syzygium,* however, the specific name *nervosum* has priority over *operculatum.*

CLEISTOCALYX PAUCIPUNCTATUS Merr. and Perr.

Cleistocalyx paucipunctatus Merr. and Perr., Jour. Arnold Arb. **18** (1937) 336, *pl. 215, figs. 22–23*

Eugenia paucipunctata Merr., Philip. Jour. Sci. **10C** (1915) 215, Enum. **3** (1923) 173, non Koord. and Val. (1899).

This species is still known only from the type collection, Luzon, Benguet Province, *Merrill Philip. Pl. 1709,* erroneously distributed as representing the distinctly different *Eugenia calcicola* Merr. The specific name originally selected by me is invalid in *Eugenia,* but in our consideration of the species under *Cleistocalyx* we deliberately published *Cleistocalyx paucipunctatus* Merr. and Perr. as a new name, not as a new combination; hence the absence of parenthetic citation in the entry above. A new specific name will be needed only by those who prefer to retain this species in *Eugenia* Linn. In its general appearance this species is remarkably similar to *Eugenia abbreviata* Elm. = *Syzygium abbreviatum* (Elm.) Merr., but the latter is a true *Syzygium,* lacking the characteristic calyx operculum of *Cleistocalyx* Blume.

SYZYGIUM Gaertner

In this paper I have interpreted *Syzygium* Gaertner to include *Jambosa* De Candolle, as did Dr. Perry [6] and myself in our 1939 consideration of the numerous Bornean representatives of the group (156), and as we did in other papers appertaining to the species of Indo-China (51 species), China (50 species), New Guinea (about 150 species), and Fiji (18 species).[7] More recently Dr. Amshoff [8] has considered the 50 species known from Java, which for the most part had been retained in

[6] Merrill, E. D. and L. M. Perry. The Myrtaceous genus Syzygium Gaertner in Borneo. Am. Acad. Arts Sci. Mem. **18** (1939) 135–202 (Mem. Gray Herb. **4** 135–202).

[7] Merrill, E. D. and L. M. Perry. The Indo-Chinese species of Syzygium Gaertner. Jour. Arnold Arb. **19** (1938) 99–116.

——— The Myrtaceae of China. Op. cit. **19** (1938) 191–247.

——— Plantae Papuanae Archboldianae, IX. Op. cit. **23** (1942) 233–297.

——— Myrtaceae in Smith, A. C. Fijian plant studies, II. Sargentia **1** (1942) 74–79.

[8] Amshoff, G. J. Myrtaceae, in Backer, C. A. Beknopte Flora van Java Alf. **IVB**(I): Myrt. (1944) 1–39, Blumea **5** (1946) 495–507.

Eugenia by earlier authors. She recognized the segregated genera *Acmena* De Candolle and *Cleistocalyx* Blume, and restricted *Eugenia* Linn. to a single species, the introduced *Eugenia uniflora* Linn.[9] As noted above, Guillaumin, for the New Caledonian species of this complex recognized *Eugenia* Linn. (apparently all species belonging in *Jossinia* Commerson), *Jambosa* De Candolle, *Syzygium* Gaertner, and *Acicalyptus* A. Gray (which we believe cannot be distinguished from *Cleistocalyx* Blume), and further retained *Caryophyllus* Linn. as generally distinct from *Syzygium* Gaertn. Clearly the modern trend is to a reasonable division of that vast aggregate retained by most authors under a single generic designation, *Eugenia* Linnaeus.

Airy Shaw,[10] while accepting *Syzygium* Gaertner as generically distinct from *Eugenia* Linnaeus, voices his objection to the segregation of such small groups as *Acmena* De Candolle and *Cleistocalyx* Blume from Gaertner's genus, preferring to retain *Syzygium* Gaertner, *sensu latissimo*, to take most of the Old World species of this complex. In further amplifying the characters of *Syzygium* Gaertner by the reduction of *Aphanomyrtus* Miq. (*Pseudoeugenia* Scortechini) and *Tetraeugenia* Merrill, he states:

"I am convinced, however, that there is no justification for maintaining either *Tetraeugenia* Merr. or *Aphanomyrtus* Miq. (*Pseudoeugenia* Scort.) distinct from *Syzygium* Gaertner, of which they surely represent merely the extreme stages in floral reduction. In vegetative characters there is nothing to distinguish them from *Syzygium;* they totally lack any *facies* of their own. For the same reason I believe that *Acmena* DC. and *Cleistocalyx* Bl. should not be separated from the larger genus; both contain forms intimately linked with various species of *Syzygium.* With better reason could Miquel's section *Leptomyrtus* be raised to generic rank for the rather distinct group of *Syzygium* with conspicuous bracteoles and glaucous angled calyx-tubes."

As opposed to those who would still further subdivide *Syzygium* Gaertner, such as Guillaumin, and those who would

[9] *Syzygium amshoffianum* nom. nov.

Eugenia dolicophylla Koord. and Val., Meded. Lands Plantent. 40 (1909) 78. (Bijdr. Boomsoort. Java 6:78) "doligophylla," Atlas Baumart; Java 3 (1915) *pl. 462*, non Kiaersk. (1893).

Syzygium dolichophyllum Amshoff, in Backer, Beknopte Fl. Java IVB (I): Myrt. (1944) 23, non Merr. and Perr. (1942).

A species known only from Java. The currently used specific name is invalid in both *Eugenia* and *Syzygium. Syzygium dolichophyllum* Merr. and Perr. is a New Guinea species based on *Jambosa dolichophylla* Lauterb and K. Sch.

[10] Airy Shaw, H. K. Additions to the flora of Borneo and other Malay Islands. Kew Bull. (1949) 117–125.

amplify its characters by the reduction of the genera above mentioned, there are, of course, those who cannot bring themselves to subdivide the protean *Eugenia,* and who continue to use that generic designation *sensu latissimo.* Henderson's [11] recent excellent consideration of the species of the Malay Peninsula represents the views of the ultra-conservatives. His estimate of the number of distinct species as "about 1,000" is more than conservative. I suspect from my own studies that merely the *Syzygium* complex as it is developed in the Old World tropics may already exceed that number, and the number of true *Eugenia* species in tropical America is legion.

The arguments for a limited number of segregated genera have been well stated by their proponents. Those who are in favor of retaining all species of both hemispheres in one manifestly collective genus, *Eugenia* Linn., *sensu latissimo,* and those who favor the segregation of most of the Old World species under *Syzygium* as a collective genus for the very numerous Old World species, have stated their case. In a third category are those, among whom I am one, who recognize *Syzygium* for most of the Old World species, but who advocate the segregation of certain small and reasonably distinct (or in some cases very distinct) groups as worthy of generic status. There is no unanimity of opinion as to what constitutes a genus or as to the limits of this or that group, nor is there likely to be until such time as some able and courageous individual with ample time and access to comprehensive collections of study material may be inspired to challenge the generic limits for both the New World and the Old World forms. I have an idea from my limited knowledge of the New World species, that there may ultimately be as many, or more, genera segregated from the New World complex as have been proposed for the Old World *Syzygium* complex.

The claim that *Eugenia* should not be subdivided merits some attention, although those who accept this concept are frankly following the lines of least resistance. To accept *Syzygium* Gaertner as all-inclusive for the Old World species of *Eugenia,* denying the validity of such proposed segregates as *Cleistocalyx, Acmena, Jossinia, Aphanomyrtus* (*Pseudoeugenia*), and perhaps even *Jambosa* and *Caryophyllus,* and other groups which have been characterized by this or that author, impresses me as somewhat illogical. It is evident that

[11] Henderson, M. R. The genus Eugenia (Myrtaceae) in Malaya. Gard. Bull. Singapore 12 (1949) 1–293, *figs. 1–54.*

with complete material, most or all of these segregated groups are more easily and definitely separable from *Syzygium,* than is *Syzygium* separated from *Eugenia* proper. If one cannot subdivide *Syzygium* on the basis of evident and reasonably constant characters, why attempt to distinguish *Syzygium* from *Eugenia,* and why not return to the Bentham-Hooker f. concept?

In accepting the name *Syzygium* Gaertn. (1788) in preference to *Caryophyllus* Linn. (1754), assuming the two groups to be congeneric, we believe that our procedure in 1939 was legitimate, in spite of the mild criticism inferred by Henderson's statement (probably a reflection of Furtado's opinion) that we complicated the situation by accepting *Syzygium* Gaertn. in place of the earlier *Caryophyllus* Linn., recommending at the same time that Gaertner's name be officially conserved against the Linnaean one. He states: "But the practice of using a later name in the hope that at some future date it may be conserved against an older valid name seems a somewhat dubious procedure." I still believe that our point was well taken, in that up to 1939 only 22 binomials had been published under *Caryophyllus,* and that there had been no transfers to it since 1874 except one in 1905, as against 300 published binomials in *Syzygium.* The numbers now stand as of 1950 at 33 for *Caryophyllus* and over 700 for *Syzygium,* to which may be added about 160 new binomials in the latter genus appearing in this paper. In this particular case there are those who prefer to retain *Caryophyllus* Linn. as generically distinct from *Syzygium* Gaertn. I am of the opinion that all of the species recognized by Henderson for the Malay Peninsula, outside of the very few in his sections *Acmena, Cleistocalyx,* and perhaps *Fissicalyx,* belong in *Syzygium,* and if these be transferred, about 90 additional new binomials will be involved in the latter genus.[12]

In 1915 I called attention to the fact that there was nothing in the modern concept of the rubiaceous genus *Nauclea* Linn. that conformed to the original Linnaean concept and definition.[13] Hasskarl had observed this in 1839, and then actually redefined *Nauclea* with himself as its authority, leaving out of consideration the Linnaean concept entirely. This procedure was, of course, not in conformity with any accepted rules of nomenclature. Yet clearly in this case *Nauclea* Hassk. (1839) should have been recommended for conservation against *Nauclea* Linn. (1762), and the Linnean designation thus disposed of *Sarcocephalus* Afzel. (1818) in its currently accepted sense would

have been available to take the Linnaean *Nauclea* species. Unfortunately, as I now see it, I adhered strictly to the letter of the law, proposed *Neonauclea* Merr. to take the species of *Nauclea* Hassk., non Linn. and most other modern authors, reinstated *Nauclea* Linn. to replace *Sarcocephalus* Afzel., transferring 46 *Nauclea* names to *Neonauclea* Merr. and 20 *Sarcocephalus* names to *Nauclea* Linn. There will always be constant confusion as between *Nauclea* Hassk., non Linn. *Neonauclea* Merr., and *Nauclea* Linn., non Hassk. (*Sarcocephalus* Afzel.); and yet unless official conservation intervenes, the generic names must, or at least should, be applied as I then indicated. I have been tempted at times to initiate action for conservation of *Nauclea* Hassk., non Linn. and *Sarcocephalus* Afzel. (*Nauclea* Linn.). In fact, I have urged some of my correspondents that such action should be taken merely as a matter of convenience.

As to the Philippine species of this *Syzygium-Eugenia* complex, the first intensive study of the group by Dr. C. B. Robinson in 1909, resulted in his recognizing 98 species. The percentage of endemism was very high. As the collections of reference material increased it became evident that the genus contained a great many more species than was indicated in 1909. By 1923 when my Enumeration of Philippine Flowering Plants was published, the number of species had been increased to 182, and since that time a few additional species have been described. In these early studies *Eugenia* Linn. was interpreted

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[12] *Syzygium hendersonii* nom. nov.

Eugenia auriculata Ridl., Jour. Str. Branch Roy. As. Soc. **61** (1912) 7; Henders. Gard. Bull Singapore **12** (1949) 54, *fig. 6a*, non *Syzygium auriculatum* Brongn. and Gris (1865). Malay Peninsula, Dindings at Lumut.

Syzigium urophyllum nom. nov.

Eugenia caudata King, Jour. As. Soc. Beng. **702** (1901) 105. (Mater. Fl. Malay. Penin. **3**: 105); Henders. Gard. Bull. Singapore **12** (1949) 148, *fig. 29, c-d*, non *Syzygium caudatum* Airy Shaw (1949).

¿*Myrtus caudata* Wall. List. no. 3631, (1831), *nom. nud.*

In reducing *Tetraeugenia* Merr. and *Aphanomyrtus* Miq. (*Pseudoeugenia* Scort.) to *Syzygium* Gaertn., thereby further broadening the limits of the latter genus, Airy Shaw, Kew Bull. (1949) 122, also transferred *Tetraeugenia caudata* Merr. to *Syzygium*. Henderson, l. c., who saw the Calcutta specimen of *Wallich 3631*, which was from Singapore, expressed doubt if it is a *Eugenia* (*Syzygium*). While King's specific name is valid in *Eugenia*, it cannot be used in *Syzygium*. The species is rather widely distributed in the Malay Peninsula, and may occur in southern Siam.

[13] Merrill, E. D. On the application of the generic name *Nauclea* of Linnaeus. Jour. Washington Acad. Sci. **5** (1915) 539–542.

in Bentham-Hooker f. sense, following the lead of most modern authors who had studied the Old World species.

In the present study, which is frankly nomenclatural, an attempt is made to bring the technical names of the Philippine species into conformity with my present concept of reasonable generic limits for the entire group. Two species of *Eugenia* have been combined and accounted for as a single species of *Xanthomyrtus* Diels. Three species are placed under *Cleistocalyx* Blume, one under *Acmena* DC., eight under *Jossinia* Commerson, and *Eugenia* Linn. is now restricted to a single introduced species of American origin, this being *Eugenia uniflora* Linn. the actual type of the Linnaean genus, which up to 1923 had not been recorded as Philippine. Sixteen species, accepted as valid in 1923 have been reduced to synonymy. On the basis of the material available to me in the course of this study, including duplicates distributed from Manila before 1940 and determined to the genus only, and recently collected material sent to me for identification by Dr. Quisumbing, nineteen species are described as new. In spite of reductions of sixteen of the species recognized in 1923, and the transfer of certain *Eugenia* species to other generic groups, the total number of Philippine *Syzygium* species now stands at 187, slightly more than in 1923, with thirteen in segregated genera, or a total of 200. This is not the entire story. There are perhaps ten distinct species represented by inadequate specimens in the collections available to me which should not be characterized until better specimens become available. None of them can be matched in the very extensive collection of Malaysian-Philippine-Papuasian-Polynesian material available to me.

One is constantly surprised at the high percentage of endemism that characterizes this genus, whether one deals with the species of China, Indo-China, the Malay Peninsula, Sumatra, Borneo, Java, the Philippines, Celebes, Fiji, or New Guinea. The specific endemism as of the present time for the entire complex, as to the Philippine species, is 81 per cent. A very serious attempt has been made to match the numerous Philippine species with those from neighboring islands of Malaysia and Papuasia, but with very little success; a few Philippine species have been reduced to Bornean forms, and a few have appeared in collections from the islands immediately south of the Philippines. This was to be expected in view of what is now known regarding the phytogeography of Philippine plant species. Again one is impressed by the fact that a very considerable number

of species (70) are still known only from the collections on which the original descriptions were based, a reflection of remarkably developed local endemism, and inadequate botanical exploration. It is a rather extraordinary fact that three species are still known only from the specimens collected by Hugh Cuming in various parts of the Philippines between 1836 and 1840, in spite of the vast amount of field work that has been prosecuted in the islands within the past century; and if these specimens are correctly localized, as I think they are, one of them came from mountains plainly visible from Manila.

It is a well-known fact that a very high percentage of all species in those Malaysian genera, all families, that are characteristic of the primary forests are of strictly limited geographic distribution; and essentially *Syzygium* and its allied genera are primary forest types. Instead of the endemism percentage being reduced as large collections become available from this or that region, such as Java, Celebes, New Guinea, Borneo, Sumatra, the Philippines, the Malay Peninsula, it tends to remain fairly constant as comparative studies are made. The fact that as modern collections come in from what was considered to be fairly well explored areas, new species constantly appear, merely indicates how little really intensive botanical exploration has been done in Malaysia as a whole (including the Philippines and New Guinea), as compared with such better known areas as Europe, and most of North America north of Mexico. There are those who seem to be disconcerted by the number of new species that are constantly being described from this or that area, particularly from the previously unexplored, or only most sketchily explored parts of the Malay Archipelago; and yet it is manifest that many thousands of new species will be named and characterized in future years as available collections are intensively studied and as new material becomes available.

Constantly under suspicion as being species not confined to the Philippines are those species of uniformly wide distribution within the archipelago. There are certain "wides" both as to their Philippine and extra-Philippine ranges, such as *Cleistocalyx operculatus* (Roxb.) Merr. and Perr., *Acmena acuminatissima* (Blume) Merr. and Perr., *Syzygium claviflorum* (Roxb.) Cowan and Cowan, *S. fastigiatum* (Blume) Merr. and Perr., *S. leucoxylum* Korth., *S. longiflorum* Presl, *S. oleinum* Wall., and *S. polyanthum* (Wight) Wall.; all of these are of natural distribution, as opposed to such man-distributed species

(because of their edible fruits) as *Syzygium aequum* (Burm. f.) Alston, *S. cumini* (Linn.) Skeels, *S. jambos* (Linn.) Alston, *S. malaccense* (Linn.) Merr. and Perr., and *S. samarangense* (Blume) Merr. and Perr. The last five species were manifestly introduced into the Philippines from Malaya before the islands were colonized by the Spaniards in the sixteenth century.

Among the widely distributed Philippine endemics, that is, species for the most part occurring in all of the larger islands (and many of the smaller ones), from northern Luzon to Mindanao, are *Syzygium astronioides* (C. B. Rob.) Merr., *S. bataanense* (Merr.) Merr., *S. calubcob* (C. B. Rob.) Merr., *S. clavellatum* (Merr.) Merr., *S. everettii* (C. B. Rob.) Merr., *C. luzonense* (Merr.) Merr., *S. mananquil* (Blanco) Merr., *S. mimicum* (Merr.) Merr., *S. pallidum* (Merr.) Merr., *S. phanerophlebium* (C. B. Rob.) Merr., *S. tripinatum* (Blanco) Merr., and *S. xanthophyllum* (C. B. Rob.) Merr. There is every reason to expect that some of these widely distributed Philippine species will eventually appear in collections made from insular areas to the south, southwest and southeast of the Philippines. So far, however, comparatively few of the species of this group described from Philippine material, such as *Jossinia aherniana* (C. B. Rob.) Merr., *Syzygium everettii* (C. B. Rob.) Merr., and *S. panduriforme* (Elm.) Merr. have appeared in collections made in the islands immediately south of Mindanao and between that island and Celebes; and a somewhat larger number now have the known distribution Philippines-Borneo. Most of the species having this range occur in the Philippines chiefly in the Sulu Archipelago and in Palawan, which as manifestly a natural range. Doubtless as intensive studies are made on the basis of ample collections, these lists will be somewhat increased, but I suspect that the total number of Borneo-Philippine, and Talaud-Philippine species (or even Celebes-Philippine) will never become very large.

SYZYGIUM ABBREVIATUM nom. nov.

Eugenia abbreviata Elm., Leafl. Philip. Bot. 8 (1915) 2776; Merr., Enum. 3 (1923) 156, non Urban, 1909.

The type is *Elmer 14263* from Benguet Province, Luzon, two specimens of which are before me. Two additional collections are *Loher 2489* (Herb. Kew.) and *Loher 2498* (U. S. National Herbarium, perhaps an error from *2489*) from the same province. In facies this species very closely approximates *Eugenia paucipunctata* Merr. = *Cleistocalyx paucipunctatus* (Merr.) Merr. and Perr., also from Benguet and still known only

from the type collection. However, the Elmer species is unquestionably a *Syzygium,* not a *Cleistocalyx,* although in the specimens I have seen most of the floral parts have fallen; the calyx margin is distinctly toothed, conforming to Elmer's description. In vegetative characters the species may be easily distinguished from *Cleistocalyx paucipunctatus* (Merr.) Merr. and Perr. by the distant and distinctly impressed primary nerves on the upper surfaces of the leaves. I deliberately propose *Syzygium abbreviatum* Merr. as a new name, not a new combination.

SYZYGIUM ABULUGENSE nom. nov.

Eugenia propinqua Merr., Philip. Jour. Sci. 7C (1912) 315, Enum. 3 (1923) 174, non *Syzygium propinquam* Vieill. ex Guillaumin (1938), in syn.

A species known only from the type collection, *Bur. Sci. 13911 Ramos,* from the Abulug River, Cagayan Province, Luzon.

SYZYGIUM ACROPHILUM (C. B. Rob.) comb. nov.

Eugenia acrophila C. B. Rob., Philip. Jour. Sci. 4C (1909) 389; Merr., Enum. 3 (1923) 156.

This species was based on four collections from Mount Pulog and Mount Tapulao, in Buenguet and Zambales provinces, Luzon. An additional recent collection from Mount Pulog is *P. N. H. 4327 Celestino.*

SYZYGIUM AFFINE sp. nov.

Species *S. striatulo* manifeste affinis, differt nervis primariis inter se magis (6–10 mm.) distantibus, minus adscendentibus, floribus minoribus. Ut videtur arbor parva, glabra, ramis pallidis vel pallide brunneis, teretibus, ramulis ultimis circiter 1 mm. diametro, plerumque sulcatis vel plus minusve 4–angulatis; follis ellipticis vel oblongo-ellipticis, subcoriaceis, vel coriaceis, 6–10 cm. longis, 3–5 cm. latis, sicco plerumque brunneis vel pallide brunneis, vel supra subolivaceis, opacis, breviter obtuse acuminatis, basi acutis; nervis primariis utrinque plerumque 10–12, inter se 6–10 mm. distantibus, in venam submarginalem circiter 2 mm. a margine confluentibus, subpatulis, leviter adscendentibus, subtus distinctis, elevatis, nervis secundariis reticulisque sublaxis minus distinctis, omnibus subelevatis; petiolo 4–10 mm. longo; inflorescentiis terminalibus, 5–10 cm. longis, 8–10 cm. latis, plerumque e basi ramosis, ramis primariis patulis vel subpatulis, 3–4 cm. longis, floribus in ramulis ultimis in triadibus dispositis, bracteis inferioribus linearis, 5–6 mm. longis, superioribus lineari-lanceolatis, acuminatis, brevioribus, caducis, bracteolis minutis, obscuris, deciduis; flori-

bus inter minores, sessilibus, in triadibus dispositis, calycibus circiter 6 mm. longis, deorsum angustatis, pseudostipitatis, margine crenatis in floribus vetustioribus subtruncatis, ore sub anthesin 3 mm. diametro; petalis calyptratim deciduis; filamentis numerosis, stylo 6–8 mm. longo.

LUZON, Nueva Ecija Province, *For. Bur. 22171 Alvarez* (U. S. Nat. Herb., Brit. Mus., Kew); Bulacan Province, Angat, *Bur. Sci. 22295 Ramos,* (type, herb. Arnold Arboretum, dupl. U. S. Nat. Herb., and Kew, *Merrill Philip. Pl. 1934,* distributed as *E. macgregorii* Merr., Rizal Province, Bosoboso, *Loher 2487,* (Kew), *Vidal 1416* (Kew); Quezon Province, Guinayangan, *Bur. Sci. 20820 Escritor* (Kew, U. S. Nat. Herb.); Sorsogon Province, *Elmer 17274,* erroneously distributed as *Eugenia philippinensis* C. B. Rob.

In making the preliminary identifications of all of the cited and mostly previously unidentified specimens, I at first placed them with *Eugenia macgregorii* Merr., from which they differ in the characters mentioned in contrasting the species with *Syzygium striatulum* (C. B. Rob.) Merr., another allied form.

SYZYGIUM ALBAYENSE sp. nov.

Arbor glaberrima, ramis ramulisque stricte teretibus, ultimis 3–4 mm. diametro; foliis oppositis, petiolatis (petiolo 5–10 mm. longo), coriaceis, sicco supra castaneis vel atro-castaneis, subtus paullo pallidioribus, utrinque nitidis, ellipticis vel oblongo-ellipticis, 12–18 cm. longis, 4–8 cm. latis, obscure puncticulatis, basi acutis vel late acutis, apice breviter (ca. 1 cm.) acuminatis; nervis primariis utrinque circiter 15, subtus distinctis, distantibus, leviter curvatis, in venam submarginalem 1.5–2.5 mm. a margine confluentibus, reticulis primariis laxis, obscuris; inflorescentiis terminalibus, paniculatis, circiter 15 cm. longis, e basi ramosis, ramis primariis inferioribus 10 cm. longis superioribus brevioribus, rhachidibus teretibus, ramulis ultimis obscure angulatis; floribus binis vel trinis, sessilibus, in ramulis ultimis dispositis, bracteolis paribus binis decussatis subtensis, his late ovatis, rotundatis, coriaceis, 2–3 mm. longis; floribus 4-meris, 1.2–1.5 cm. diametro, calycis tubo sub anthesin fere patelliformibus 8–10 mm. diametro, coriaceis, lobis subreniformibus, latissime rotundatis, 1.5 mm. longis et 3 mm. latis; petalis orbiculari-ovatis, late rotundatis, 5-5.5 m. longis, concavis, primo imbricatis, liberis sed vix patulis, partibus medianis perspicue consperse glandulosis; staminibus multiseriatis, filamentis ad 6 mm. longis; stylo 7 mm. longo sursum angustato.

LUZON, Albay Province, *Cuming 913,* Herb. Kew. (type) and Brit. Mus.

In spite of its distinctly petioled leaves which are acute, not cordate, at the base, and its strictly terete branches and branchlets, this species is clearly allied to *Syzygium intumescens* (C. B. Rob.) Merr. The group is a natural one, consisting of a few species, characterized by the sessile flowers which terminate the ultimate branchlets being subtended by two pairs of decussate coriaceous bracteoles.

SYZYGIUM ALCINAE (Merr.) Merr. and Perr.

Syzygium alcinae (Merr.) Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 190, (Mem. Gray Herb. 4:190).
Eugenia alcinæ Merr., Philip. Jour. Sci. 10C (1915) 216, Enum. 3 (1923) 157.

Southern Luzon, Culion, Palawan, Panay; also in British North Borneo. Various collections including *Merrill 9224, 9316.*

SYZYGIUM ALVAREZII (C. B. Rob.) comb. nov.

Eugenia alvarezii C. B. Rob., Philip. Jour. Sci. 4C (1909) 390, *excl. 18379 Alvarez;* Merr., Enum. 4 (1923) 157.
Eugenia maquilingensis Elm., Leafl. Philip. Bot. 8 (1919) 3096.

Widely distributed at higher altitudes, northern Luzon to Mindoro and Panay. It may prove to be but a high altitude form of *Syzygium nitidum* Benth., to which it is closely allied. On the other hand there may be those who would retain *Eugenia maquilingensis* Elm. as a distinct species. The actual type is *F. B. 18353 Alvarez.* Recent very typical collections are *P. N. H. 4340 Celestino, 7684, 7780 Sulit* from Mount Pulog and Mount Nañgaotc, Mountain Province, Luzon.

SYSYGIUM ANGULARE (Elm.) comb. nov.

Eugenia angularis Elm., Leafl. Philip. Bot. 4 (1912) 1434; Merr., Enum. 3 (1923) 157.

A species still known only from the original collection from Sibuyan, *Elmer 12080.*

SYZYGIUM ANGULATUM (C. B. Rob.) comb. nov.

Eugenia angulata C. B. Rob., Philip. Jour. Sci. 4C (1909) 354; Merr., Enum. 3 (1923) 157.

A species still known only from the two Mindanao collections cited in the original description, *Williams 2164, Clemens s. n.*

SYZYGIUM ANTONIANUM (Elm.) comb. nov.

Eugenia antoniana Elm., Leafl. Philip. Bot. 4 (1912) 1425; Merr., Enum. 3 (1923) 157.

A species still known only from the original collection, *Elmer 11621,* from Mount Apo, Davao, Mindanao.

SYZYGIUM APOENSE (Elm.) comb. nov.

Eugenia apoensis Elm., Leafl. Philip. Bot. 4 (1912) 1901; Merr., Enum. 3 (1923) 157.

Still known only from its original collection, *Elmer 11594* from Mount Apo, Davao, Mindanao.

SYZYGIUM AQUEUM (Burm. f.) Alst.

Syzygium aqueum (Burm. f.) Alst., Ann. Bot. Gard. Peradeniya 11 (1929) 204.

Eugenia aquea Burm. f., Fl. Ind. (1768) 114; Merr., Enum. 3 (1923) 157, *cum. syn.*

Eugenia mindanaensis C. B. Rob., Philip. Jour. Sci. 4C (1909) 363.

Widely distributed in the Malay Archipelago, as it is in the central and southern Philippines. This is one of the species that manifestly owes its present wide distribution to the activities of man who has disseminated it in cultivation because of its edible fruits. It is certainly an introduced species in the Philippines.

SYZYGIUM ASTRONIOIDES (C. B. Rob.) comb. nov.

Eugenia astronioides C. B. Rob., Philip. Jour. Sci. 4C (1909) 393; Merr., Enum. 4 (1923) 158.

Eugenia bakeri Elm., Leafl. Philip. Bot. 7 (1914) 2355.

A species extending from northern Luzon to Mindanao represented by numerous collections, including *Elmer 14031, 16212, 15375, Merrill Philip. Pl. 1122,* etc.

SYZYGIUM ATTENUATUM (Miq.) Merr. and Perr.

Syzygium attenuatum (Miq.) Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 185. (Mem. Gray Herb. 4:185).

Jambosa attenuata Miq., Fl. Ind. Bot. 1 1 (1855) 437.

Eugenia penangiana Dutchie in Hook, f., Fl. Brit. Ind. 2 (1878) 486.

Eugenia attenuata Koord. and Val., Meded. Lands Plant. 40 (1909) 121. (Bijdr. Boomsoort. Java 6:121); Henders, Gard. Bull. Singapore 12 (1949) 238, *fig. 45 a-b.*

Eugenia purpuricarpa Elm., Leafl. Philip. Bot. 4 (1912) 1435; Merr., Enum. 3 (1923) 174, *syn. nov.*

Still known as a Philippine species only from *Elmer 12818,* from Palawan. I cannot distinguish Elmer's species from *Syzygium attenuatum* (Miq.) Merr. and Perr. which is common and widely distributed in the Malay Peninsula and Borneo. Miquel's type was from Java. Certain Sumatran collections match it very closely. Airy Shaw, Kew Bull. (1949) 121, suggests that the Philippine *Syzygium clavellatum* (Merr.) Merr., *S. clementis* (C. B. Rob.) Merr., *S. rosenbluthii* (C. B.

Rob.) Merr., and *Eugenia purpuricarpa* Elm., all belonging in this group, may represent but a single species.

SYZYGIUM BALERENSE (C. B. Rob.) comb. nov.

Eugenia balerensis C. B. Rob., Philip. Jour. Sci. 6C (1911) 346, Merr. Enum. 3 (1923) 159.
Eugenia brunnea C. B. Rob., op. cit. 4C (1909) 372, non Niedenzu, 1893.

Known only from the east coast of Luzon, Quezon and Camarines, type from Baler, *Merrill 1088, 1069 bis,* etc.

SYZYGIUM BANKENSE (Hassk.) Merr. and Perr.

Syzygium bankense (Hassk.) Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 160. (Mem. Gray Herb. 4:160).
Microjambosa? bankensis Hassk., Hort. Bogor. Descr. (1858) 276.
Microjambosa besukiensis Hassk. ex Miq., Fl. Ind. Bot. Suppl. 1 (1861) 311, *nom.* in *syn.*
Jambosa buxifolia Miq., Fl. Ind. Bot. 1 1 (1858) 1086.
Eugenia bankensis Backer, Schoolfl. Java (1911) 508.
Eugenia besukiensis Merr., Jour. Straits Branch. Roy. As. Soc. 77 (1917) 226.

MINDORO, still known as a Philippine species only by a single collection, *Bur. Sci. 39440 Ramos.* Borneo, Banka; planted in Java fide Amshoff.

SYZYGIUM BARNESII (Merr.) comb. nov.

Eugenia barnesii Merr., Manila, Govt. Lab. Publ. 17 (1904) 37; C. B. Rob., Philip. Jour. Sci. 4C (1909) 360; Merr., Enum. 3 (1923 159.

Still known only from Bataan Province, Luzon, from the cited collections of *For. Bur. 140 Barnes, 733, 1198, 1236 Borden, 2774 Meyer, 251 Whitford.*

SYZYGIUM BATAANENSE (Merr.) comb. nov.

Jambosa bataanensis Merr., Manila, Govt. Lab. Publ. 17 (1904) 36.
Eugenia bataanensis Merr., Philip. Jour. Sci. 1 Suppl. (1906) 104, Enum. 3 (1923) 159.

Originally described from specimens collected in Bataan Province, Luzon, now represented by many collections from central Luzon to Mindoro, and Mindanao.

SYZYGIUM BENGUETENSE (C. B. Rob.) comb. nov.

Eugenia benguetensis C. B. Rob., Philip. Jour. Sci 4C (1909) 374.

A species known from higher altitudes, Bontoc and Benguet sub-provinces, Luzon. Additional collections are *For. Bur. 30169 Costales* from Benguet, *Sandkuhl 313* and *P. N. H. 7893 Celestino* from Mount Polis, Mountain Province (Ifugao), Luzon.

SYZYGIUM BERNARDOI (Merr.) comb. nov.

Eugenia bernardoi Merr., Philip. Jour. Sci. 18 (1921) 304.

Originally described from *For. Bur. 27074 Bernardo* from Cagayan Province, Luzon. A second collection is *Bur. Sci. 33036 Ramos* from Ilocos Norte Province, and a third is *Bur. Sci. 79464 Edaño* from Cagayan Province.

SYZYGIUM BLANCOI (Merr.) comb. nov.

Eugenia blancoi Merr., Philip. Jour. Sci. 10C (1915) 160.

The basis of this species was *Bur. Sci. 17492, 17623 Ramos* from Samar. Additional collections are *Bur. Sci. 21261, 23770, 33538, Ramos* from Camarines Province, Luzon. In general appearance the specimens very closely approximate *Cleistocalyx arcuatinervius* (Merr.) Merr. and Perr. but the calyx is that of *Syzygium,* not of *Cleistocalyx.*

SYZYGIUM BORDENII (Merr.) comb. nov.

Eugenia bordenii Merr., Manila, Govt. Lab. Publ. 35 (1906) 47, Enum. 3 (1923) 160.

Northern Luzon to Mindanao and Basilan represented by numerous collections, the type from Bataan Province, Luzon.

SYZYGIUM BORNEENSE (Miq.) Miq.

Syzygium borneense (Miq.) Miq., Fl. Ind. Bat. 1 (1855) 453; Merr. and Perr., Mem. Amer. Acad Arts Sci. 18 (1939) 190 (Mem. Gray Herb. 4:190), *cum. syn.*

Eugenia borneensis Miq., Anal. Bot. Ind. 1 (1850) 24, *pl.* 7.

Eugenia microcalyx Duthie, in Hook. f. Fl. Brit. Ind. 2 (1878) 493; Henders. Gard. Bull. Singapore 12 (1949) 202.

Eugenia ixoroides Elm., Leafl. Philip. Bot. 4 (1912) 1426; Merr., Enum. 3 (1923) 167.

Elmer 13165 is the type of *Eugenia ixoroides* Elm. which I now, without hesitation, reduce to Miquel's species. Henderson in 1949 most conservatively retained *Eugenia microcalyx* Duthie as the proper name for the species as he understood it, although when we (Merrill and Perry) reduced Duthie's species in 1939, this was on the basis of a critical examination of Miquel's type, which Henderson unfortunately did not see. Miquel's artists in 1850 erred in showing the flowers to have free petals; they are closely imbricate and fall as a sort of calyptra in both the Utrecht fragment that Miquel retained, and the more ample sheet at Leiden. Other collections from Borneo, besides the Korthal's original one, are *Abdul Rasjid 2437, Winkler 3388, Endert 1584, Clemens 22295, Boschproefstation 14167, 14661;* there are many Malay Peninsula collections. The species is as yet known from the Philippines only

by the single Palawan collection cited; it is apparently common in Borneo and in the Malay Peninsula, and should occur in Sumatra. The geographic range is a logical one.

SYZYGIUM BRACHYURUM sp. nov.

§ *Jambosæ.* Arbor glaberrima, ramis ramulisque teretibus, ultimis circiter 1 mm. diametro, floribus 8–10 mm. diametro, depauperato-fasciculatis, graciliter pedicellatis, pedicellis e tuberculis lignosis 3–7 mm. diametro, in ramulis infra foliis dispositis; foliis chartaceis vel subcoriaceis, opacis, oblongis, supra olivaceis, subtus paullo pallidioribus, glanduloso-punctatis, glandulis numerosis, 8–12.5 cm. longis, 1.5–3 cm. latis, basi late acutis vel subrotundato-obtusis, apice subabrupte subcaudato-acuminatis, acuminibus obtusis vel subacutis, angustis, 5–10 mm. longis; nervis primariis utrinque 25–30, inter se 3–5 mm. distantibus, distinctis sed haud perspicuis, subpatulis, in venam submarginalem 2–3 mm. a margine confluentibus, retuculis sublaxis, haud perspicuis; petiolo 2–3 mm. longo; tuberculis floriferis lignosis, subglobosis, irregulariter sublobatis, 3–7 mm. diametro, floribus paucis gerentibus; floribus ut videtur albidis, 4-meris, 8–10 mm. diametro, graciliter pedicellatis, pedicellis 1-floris circiter 1.5 cm. longis, sursum bracteolis 1 vel 2, minutis ovatis obtusis vix 0.3 mm. longis gerentibus, calycis tubo late infundibuliformis circiter 3 mm. diametro, deorsum abrupte angustato, lobis ellipticis, rotundatis, punctato-glandulosis, 3 mm. longis, 2.5 mm. latis; petalis ellipticis vel late oblongo-ellipticis liberis, patulis, obtusis, circiter 4 mm. longis et 2.5 mm. latis, consperse glanduloso-punctatis; staminibus multiseriatis, filamentis interioribus 1–2 mm. exterioribus ad 6 mm. longis; fructibus ignotis.

LUZON, Camarines Norte Province, Bicol National Forest Park, *Philip. Nat. Herb. 9768 Martin Lagrimas,* May 27, 1949, altitude 100 m.

Because of the slenderly pedicelled solitary to depauperate-fasciculate flowers springing from small lignified tubercles at or near the nodes on the branches and branchlets below the leaves, this species at first sight suggested *Jossinia;* dissection of the flowers, however, shows that the several-seriate stamens are borne on the calyx tube, not on an epigynous disk as in *Jossinia.* It is strikingly characterized by its vegetative and inflorescence characters, but has no close allies among the numerous Philippine species of *Syzygium,* or those of Malaysia known to me.

SYZYGIUM BREVIPANICULATUM (Merr.) comb. nov.

Eugenia brevipaniculata Merr., Philip. Jour. Sci. 11C (1916) 23, Enum. 3 (1923) 160.

Still known only from the original Sorsogon collection, *Bur. Sci. 23567 Ramos.*

SYZYGIUM BRITTONIANUM (C. B. Rob.) comb. nov.

Eugenia brittoniana C. B. Rob., Philip. Jour. Sci. 4C (1909) 398; Merr. Enum. 3 (1923) 160.

Known only from Bontoc and Benguet subprovinces, in northern Luzon, *Williams 1464, 1461, Bur. Sci. 40425 Ramos* and *Edaño.*

SYZYGIUM CAGAYANENSE (Merr.) comb. nov.

Eugenia cagayanensis Merr., Philip. Jour. Sci. 10C (1915) 214, Enum. 3 (1923) 160.

Known only from Cagayan Province, Luzon. Additional collections are *For. Bur. 29517 Aloba* from Camalingan, and *Bur. Sci. 78562 Edaño* from the Pinagsongyan River, Cagayan.

SYZYGIUM CALCICOLUM (Merr.) comb. nov.

Eugenia calcicola Merr., Philip. Jour. Sci. 10C (1915) 209, Enum. 3 (1923) 161.

Widely distributed in Luzon, the type from Benguet, *Merrill 9746, Bur. Sci. 14922, 23827 Ramos,* etc. Very similar to the low altitude *Syzygium alcinae* (Merr.) Merr.

SYZYGIUM CALLERYANUM (C. B. Rob.) comb. nov.

Eugenia calleryana C. B. Rob., Philip. Jour. Sci. 6C (1911) 348; Merr., Enum. 3 (1923) 161, *cum. syn.*

Still known only from Luzon (Abra, Benguet, Zambales, Bataan, Rizal), unless fruiting specimens from Zamboanga Peninsula, Mindanao (*Ahern* s. n.) should prove to belong here when flowering specimens from that region become available. Represented by *Elmer 6130, Loher 6040, For. Bur. 423 Ahern's collector,* etc.

SYZYGIUM CALUBCOB (C. B. Rob.) comb. nov.

Eugenia calubcob C. B. Rob., Philip. Jour. Sci. 4C (1909) 364; Merr., Enum. 3 (1923) 161, *cum. syn.*

A common species extending from the Batan Islands and northern Luzon to Palawan and Mindanao.

SYZYGIUM CANDELABRIFORME (C. B. Rob.) comb. nov.

Eugenia candelabriformis C. B. Rob., Philip. Jour. Sci. 4C (1909) 375; Merr., Enum. 3 (1923) 161.

Widely distributed in northern Luzon, extending south to Laguna and Rizal provinces, *Bur. Sci. 23823, 22689 Ramos, 37648 Ramos* and *Edaño,* etc.

SYZYGIUM CAPOASENSE (Merr.) comb. nov.

Eugenia capoasensis Merr., Philip. Jour. Sci. 10C (1915) 209, Enum. 3 (1923) 162.

Still known only from the type collection, *Merrill 9493* from Palawan.

SYZYGIUM CARDIOPHYLLUM (Merr.) comb. nov.

Eugenia cardiophylla Merr., Philip. Jour. Sci. 18 (1921) 305, Enum. 3 (1923) 162.

Still known only from the type collection from Mindanao (Bukidnon), *For Bur. 26534 Rola.*

SYZYGIUM CASIGURANENSE (Quis.) comb. nov.

Eugenia casiguranensis Quis., Philip. Jour. Sci. 41 (1930) 337, *fig. 12.*

This was based on *Bur. Sci. 45464 Ramos* and *Edaño* from Casiguran, Quezon Province, Luzon. Their no. *45499* from the same locality and *For. Bur. 30049 Sulit,* from the same province apparently represent the same species; also *Bur. Sci. 24312 Ramos* from Mount Irig, Rizal Province.

SYSYGIUM CAVITENSE sp. nov.

Species *S. decipienti* affinis, differt inflorescentiis multo minoribus, sub fructu vix 2.5 cm. attingentibus, foliis minoribus, 6–9 cm. longis. Arbor glabra, ramis ramulisque teretibus pallide brunneis, ultimis circiter 1 mm. diametro; foliis ellipticis vel suboblongo-ellipticis, firmiter chartaceis vel subcoriaceis, 6–9 cm. longis, 2.5–4 cm. latis, utrinque subaequaliter angustatis, basi acutis, apice obtuse acuminatis, sicco brunneis, subtus paullo pallidioribus et dense minuteque puncticulatis, opacis vel leviter nitidis; nervis primariis numerosissimis, parallelis, gracilibus, inter se circiter 2 mm. distantibus, in venam intramarginalem 1.5–2 mm. a margine confluentibus, secundariis reticulisque minus distinctis; petiolo 5–8 mm. longo; inflorescentiis lateralibus, plerumque infra foliis in axillis defoliatis, 2–2.5 cm. longis, solitariis vel subfasciculatis, breviter pedunculatis vel e basi famosis, ramis paucis (1–3), brevibus; fructibus paucis breviter pedicellatis, plerumque depresso-globosis, 7–10 mm. diametro.

LUZON, Cavite Province, *Bur. Sci. 22584 Ramos* and *Deroy,* April–May, 1915, type Gray Herbarium, isotypes Arnold Arboretum, U. S. National Herbarium, and Kew.

A species clearly allied to the Javan *Syzygium decipiens* (Koord. and Val.) Merr. and Perr. as well illustrated by Koorders and Valeton in their Atlas 3 (1915), *pl. 495,* and to

the Philippine form perhaps incorrectly referred by C. B. Robinson to that species. The striking difference, aside from the smaller leaves, is found in the short infructescences of *S. cavitense*. In the original description of the Javan form the leaves are indicated as 12.5 to 14 cm. long, and the widely branching inflorescences as 20 to 30 cm. in diameter, these, like the infructescences of this Cavite form, born on the slender branches below the leaves. In the Philippine form currently referred to *S. decipiens* (Koord. and Val.) Merr. and Perr. the leaves and inflorescences are smaller than in the Javan plant, but larger than in *S. cavitense* Merr.

SYZYGIUM CILIATO-SETOSUM (Merr.) comb. nov.

Eugenia ciliato-setosa Merr., Philip. Jour. Sci. 7C (1912) 315, Enum. 3 (1923) 162.

Originally known only from Cagayan Province, Luzon. Additional collections are *Bur. Sci. 78258, 78442 Edaño* from Cagayan Province, *Bur. Sci. 45563 Ramos* and *Edaño*, and *P. N. H. 4717, 5441, Alcasid* and *Edaño* from Quezon Province, Luzon. Strikingly different from all other known Philippine species in this large genus in its characteristics indumentum.

SYZYGIUM CINNAMOMEUM (Vidal) comb. nov.

Eugenia cinnamomea Vidal, Phan. Cuming. Philip. (1885) 172; Merr., Enum. 3 (1923) 162.

LUZON (Cagayan to Albay), Mindoro. An additional collection is *P. N. H. 5640 Alcasid* and *Edaño*, from Nueva Ecija Province, Luzon. The type is *Cuming 846*.

SYZYGIUM CLAVELLATUM (Merr.) comb. nov.

Eugenia clavellata Merr., Philip. Jour. Sci. 1 Suppl. (1906) 104, Enum. 3 (1923) 162.

LUZON (Bataan to Sorsogon), Samar, Mindanao, *Merrill Philip. Pl. 1415, 1676, Elmer 15660*, etc.

SYZYGIUM CLAVIFLORUM (Roxb.) Cowan and Cowan

Syzygium claviflorum (Roxb.) Cowan and Cowan, Trees North Bengal (1929) 67; Merr. and Perr., Jour. Arnold Arb. 19 (1938) 221.

Eugenia claviflora Roxb., Hort. Beng. (1814 37 *nom. nud.*, Fl. Ind. ed. 2 2 (1832) 488 descr.; Merr., Enum. 3 (1923) 162; Henders., Gard. Bull. Singapore 12 (1949) 252, *fig. 49a. cum. syn.*; *Jambosa clavata* Korth. (1847); *E. rhodendrifolia* Miq. (1850); *Myrtus clavata* Korth. ex Miq., (1850); *Jambosa borneensis* Miq. (1855); *Eugenia ruminata* Koord. and Val. (1900); *E. fraseri* Ridl. (1930); *E. viridifolia* Elm. (1912); *Syzygium clavatum* Merr. and Perr. (1939); *Syzygium viridiflorum* Merr. and Perr. (1939).

BATAN ISLANDS and northern Luzon to Samar, Leyte, and Palawan and, outside of the Philippines, Sikkim and Bengal to Burma, Siam, Indo-China, southern China, Malay Peninsula, Anamba Islands, Java and Borneo.

In several of the above reductions, notably the Bornean *Syzygium clavatum* (Korth.) Merr. and Perr., and the Philippine *S. viridifolium* (Elm.) Merr. and Perr., I defer to Mr. Henderson's judgment, as he had abundant material for study. However, he interpreted *Eugenia claviflora* Roxb. as a collective species with five varieties (*leptalea* (Craib) Henders, *excavata* King, *maingayi* King, *riparia* Henders., and *montana* Henders.). It may be that several distinct species are represented in the complex as he interpreted it.

SYZYGIUM CLEMENTIS (C. B. Rob.) comb. nov.

Eugenia clementis C. B. Rob., Philip. Jour. Sci. 4C (1909) 383; Merr., Enum. 3 (1923) 163.

LUZON (Sorsogon), Panay, Mindanao, *Bur. Sci. 22151 Ramos* from Camarines Province, Luzon, apparently belongs here.

SYZYGIUM CONFERTUM (Korth.) Merr. and Perr.

Syzygium confertum (Korth.) Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 177. (Mem. Gray. Herb. 4:177); Amshoff, Blumea 5 (1945) 499.

Jambosa conferta Korth., Nederl. Kruidk. Arch. 1 (1847) 202.

Microjambosa conferta Blume, Mus. Bot. Lugd.-Bat. 1 (1849) 118.

Eugenia densepunctata Koord. and Val., Meded. Lands Plantent. 40 (1900) 97. (Bijdr. Boomsoort. Java 6:97).

Eugenia calvinii Elm., Leafl. Philip. Bot. 4 (1912) 1419; Merr., Enum. 3 (1923) 161.

Elmer 12869 from Palawan, type of *Eugenia calvinii* Elm. is the only known Philippine collection. Sumatra, Java, Borneo.

SYZYGIUM CONGESTUM (Merr.) comb. nov.

Eugenia congesta Merr., Manila, Govt. Lab. Publ. 35 (1906) 49, Enum. 3 (1923) 163.

LUZON (Benguet to Sorsogon). Additional collections are *Bur. Sci. 76256 Edaño* and *P. N. H. 2833 Convocar* from Mount Isarog, Camarines Sur Province, Luzon.

SYZYGIUM CONGLOBATUM (C. B. Rob.) comb. nov.

Eugenia conglobata C. B. Rob., Philip. Jour. Sci. 4C (1909) 359; Merr., Enum. 3 (1923) 163.

Eugenia subsulcata Elm., Leafl. Philip. Bot. 4 (1909) 359; Merr., Enum. 3 (1923) 3.

Central Luzon to Mindanao and Palawan. Additional collections are *For. Bur. 21613 Agama* from Palawan, *Bur. Sci. 48120 Ramos* and *Edaño*, Alabat, and *Wenzel 3262* from Surigao Province, Mindanao.

SYZYGIUM CONSANGUINEUM (Merr.) comb. nov.

Eugenia consanguinea Merr., Philip. Jour. Sci. 18 (1921) 300, Enum. 3 (1923) 163.

Northern Luzon (Abra). Still known only from the two original collections on which the species was based, *Bur. Sci. 26984, 26995 Ramos.*

SYZYGIUM CONSIMILE sp. nov.

Arbor parva, glabra, 6–10 m. alta, ramis ramulisque teretibus, laevibus, brunneis vel atro-brunneis, ultimis 2 mm. diametro; foliis crasse coriaceis, rigidis, ellipticis vel oblongo-ellipticis, olivaceo-brunneis vel pallide brunneis, 9–14 cm. longis, 5–7 cm. latis, leviter nitidis vel subopacis, subtus obscure consperse glandulosis, margine cartilagineis subrevolutis, basi late acutis, apice subabrupte acuminatis, acuminibus 1–1.5 cm. longis, acutis vel subobtusis, subfalcatis; nervis primariis utrinque 12–14, utrinque paullo elevatis, quam secundariis reticulisque sublaxis paullo distinctioribus, in nervam submarginalem vix 1 mm. a margine confluentibus; petiolo 10–12 mm. longo; inflorescentiis termilibus et in axillis superioribus, 4–5 cm. longis latisque, pedunculatis (pedunculo ad 2 cm. longo) vel e basi ramosis, ramis primariis paucis, plerumque circiter 1 cm. longis; floribus inter mediocris, albidis, sessilibus, in ramulis ultimis plus minusve confertis, ramulis singulis floribus 5–6 gerentibus; bracteis triangulari-ovatis, acutis vel subacutis, coriaceis, rigidis, circiter 2 mm. longis, bracteolis binis similibus sed paullo brevioribus; calycis tubo crasso, circiter 7 mm. longo, deorsum angustato sed haud pseudostipitato, ore circiter 5 mm. diametro, margine undulato; petalis valde imbricatis, plus minusve adherentibus, calyptratim deciduis; filamentis numerossimis, ad 8 mm. longis.

SAMAR, Mount Calbiga and Bagacay, near Concord, *Philip. Nat. Herb. 6341, 6442* (type) *Sulit,* May 17 and 22, 1948, on forested slopes, alt. 200–350 m. A fruiting specimen, *Whitford 1227* (Herb. Kew.) from Bataan Province, Luzon, apparently belongs here.

This species in facies closely approximates *Syzygium lacustre* (C. B. Rob.) Merr., of the Lanao region, Mindanao, and was at first taken to represent that species. It differs radically

in its rather strongly developed, very coriaceous bracts and bracteoles, the latter persisting at the base of the crowded, sessile flowers. The sessile, subglobose fruits on *Whitford 1227*, mentioned above, are 1.5 to 2 cm. in diameter.

SYZYGIUM COPELANDII (C. B. Rob.) comb. nov.

Eugenia copelandii C. B. Rob., Philip. Jour. Sci. 4C (1909) 352; Merr., Enum. 3 (1923) 163.

LEYTE, Mindanao. An additional collection is *Bur. Sci. 43120 Ramos* from Bohol.

SYZYGIUM CORDATILIMBUM (Merr.) comb. nov.

Eugenia cordatilimba Merr., Philip. Jour. Sci. 27 (1925) 40.

LUZON (Rizal Province). Additional collections are *Loher 6035* from Montalban, Rizal Province and *P. N. H. 6623 Edaño* from Lake Danao, Negros.

SYZYGIUM CORTICO-PAPYRACEUM (Elm.) comb. nov.

Eugenia cortico-papyracea Elm., Leafl. Philip. Bot. 4 (1912) 1405; Merr., Enum. 3 (1923) 163.

Still known only from the type collection, *Elmer 11571* from Davao, Mindanao.

SYZYGIUM COSTULATUM (C. B. Rob.) comb. nov.

Eugenia costulata C. B. Rob., Philip. Jour. Sci 4C (1909) 393; Merr., Enum. 3 (1923) 163.

LUZON (Pangasinan to Camarines). Additional collections are *Vidal 337, 2800* (herb. Kew.) from Bataan and Camarines provinces, Luzon.

SYZYGIUM CRASSIBRACTEATUM (Merr.) comb. nov.

Eugenia crassibracteata Merr., Philip. Jour. Sci. 10C (1915) 210, Enum. 3 (1923) 164.

Still known only from the original collection, *Bur. Sci. 15358 Ramos* from Leyte.

SYZYGIUM CRASSILIMBUM (Merr.) comb. nov.

Eugenia crassilimba Merr., Philip. Jour. Sci. 27 (1925) 41.

Still known only from the original collection, *Loher 14208* from Rizal Province, Luzon.

SYZYGIUM CRASSIPES (C. B. Rob.) comb. nov.

Eugenia crassipes C. B. Rob., Philip. Jour. Sci. 4C (1909) 361; Merr., Enum. 3 (1923) 164.

A widely distributed Luzon species extending from Cagayan Province to Quezon (Tayabas). A recent additional collection is *P. N. H. 4162 Edaño* from the type locality, Lamao, Bataan Province, Luzon.

SYZYGIUM CRASSISSIMUM (Merr.) comb. nov.

Eugenia crassissima Merr., Philip. Jour. Sci. 10C (1915) 211; Merr., Enum. 3 (1923) 164.

This was based on *Bur. Sci. 15387 Ramos* from Leyte. Additional collections are *Bur. Sci. 84066 Ramos* and *Convocar.* Dinagat, and with somewhat smaller leaves, *Bur. Sci. 45656 Ramos* and *Edaño* from Nueva Vizcaya Province, *Bur. Sci. 42224 Ramos* from Mt. Lumutan, Rizal Province (distributed as a new species, the specific name derived from that of the mountain), and *P. N. H. 4530 Alcasid* and *Edaño* from Mt. Camatis, Quezon Province, Luzon.

SYZYGIUM CUMINI (Linn.) Skeels

Syzygium cumini (Linn.) Skeels, U. S. Dept. Agr. Bull. 248 (1912) 25.

Myrtus cumini Linn., Sp. Pl. (1753) 471.

Eugenia cumini Druce, Bot. Excl. Club 3 (1914) 418; Merr., Enum. 3 (1923) 164, *cum. syn.*

A species of very wide distribution in the tropics of both hemispheres, commonly known as *Eugenia jambolana* Lam. (*Syzygium jambolanum* DC.). Native of the Indo-Malaysian region, of prehistoric introduction into the Philippines where it now occurs as a naturalized species in most islands and provinces.

SYZYGIUM CURRANII (C. B. Rob.) comb. nov.

Eugenia curranii C. B. Rob., Philip. Jour. Sci. 4C (1909) 351; Merr., Enum. 3 (1923) 164.

LUZON (Laguna, Camarines), Samar. One of the species with large leaves, sharply 4-angled and usually narrowly winged branchlets, and fascicled cauline inflorescences born on small tubercles. A recent collection is *P. N. H. 6888 Sulit* from Laguna Province, Luzon.

SYZYGIUM CURTIFLORUM (Elm.) comb. nov.

Eugenia curtiflora Elm., Leafl. Philip. Bot. 1 (1908) 328; Merr., Enum. 3 (1923) 164.

LUZON (Benguet, Laguna, Quezon). The type is *Elmer 8768* from Benguet.

SYZYGIUM DAVAOENSE (Elm.) comb. nov.

Eugenia davaoensis Elm., Leafl. Philip. Bot. 4 (1912) 1439; Merr., Enum. 3 (1923) 165.

A species known only from the original collection, *Elmer 11342,* Davao, Mindanao.

SYZYGIUM DECIPIENS (Koord. and Val.) Merr. and Perr.

Syzygium decipiens (Koord. and Val.) Merr. and Perr., Jour. Arnold Arb. **23** (1942) 281; Amshoff in Backer, Beknopte Fl. Jav. Afl. **IVB(I)**: Myrt. (1944) 16, and in Blumea **5** (1945) 497.

Eugenia decipiens Koord. and Val., Bull. Inst. Bot. Buitenz. **2** (1899) 6, Meded. Lands Plantent. **40** (1900) 131. (Bijdr. Boomsoort. Java **3**:131), Atlas Baumart. Java **3** (1915) *pl. 495;* C. B. Rob., Philip. Jour. Sci. 4C (1909) 386; Merr., Enum. **3** (1923) 165.

LUZON (Bataan), *For. Bur. 1184 Borden, 2781 Meyer.* Java, Solomon Islands, New Guinea.

The leaves and inflorescences of the Philippine and Solomon Islands specimens are smaller than are those of the Javan type. The discontinuous distribution is somewhat disconcerting, suggesting that more than one species may be represented; see note under *Syzygium cavitense* Merr., *supra.* I have no Javan specimens.

SYZYGIUM DENSINERVIUM (Merr.) comb. nov.

Eugenia densinervia Merr., Philip. Jour. Sci. **1** Suppl. (1906) 105, Enum. **3** (1923) 165.

Eugenia silvestrei Elm., Leafl. Philip. Bot. **8** (1918) 3095.

Central and southern Luzon, Mindoro, *Elmer 16771, 18011, Bur. Sci. 26436 Ramos* and *Edaño,* etc. The type of *E. densinervia* Merr. was from Bataan Province; that of *E. silvestrei* Elm. was from Laguna Province, Luzon. I see no reason for distinguishing the latter. The species is very closely allied to the widely distributed Indo-Malaysian *Syzygium fastigiatum* (Blume) Merr. and Perr.

SYZYGIUM DIFFUSIFLORUM nom. nov.

Eugenia diffusa Merr., Philip. Jour. Sci. **18** (1921) 301, Enum. **3** (1923) 165, non Turr. (1915), non *Syzygium diffusum* Merr. and Perr. (1942).

A Philippine endemic known only from the original collection, *Bur. Sci. 27155 Ramos,* Ilocos Norte Province, Luzon.

SYZYGIUM DURUM (Merr.) comb. nov.

Eugenia dura Merr., Philip. Jour. Sci. **11C** (1916) 24, Enum **3** (1923) 165.

Southern Luzon (Camarines, Sorsogon). Closely allied to *S. malagsam* (Elm.) Merr. of Mindanao. Represented by *Bur. Sci. 23670 Ramos, 33455 Ramos* and *Edaño, Elmer 16007, 17320.*

SYZYGIUM EBALOII sp. nov.

Jambosae. Arbor glabra circiter 8 m. alta, ramis pallidis, teretibus, floriferis 8 mm. diametro; foliis magnis, oblongis, chartaceis vel subcoriaceis, utrinque olivaceis, subtus paullo

pallidioribus, epunctatis, opacis, 30–55 cm. longis, 9–12 cm. latis, ut videtur acuminatis, basi cuneatis; nervis primariis utrinque circiter 18, inter se 1.5–3 cm. distantibus, supra inconspicuis, subtus elevatis, perspicuis, curvatis, in venam intramarginalem circiter 3 mm. a margine arcuato-confluentibus, reticulis inconspicuis; petiolo circiter 2.5 cm. longo; inflorescentiis axillaribus vel e axillis defoliatis, brevibus, circiter 2.5 cm. longis, e basi ramosis, paucifloris, bracteis nullis vel deciduis; floribus mediocris, breviter pedicellatis, rubris; calycibus infundibuliformibus, tubo deorsum angustato, circiter 8 mm. longo, sursum ampliato, ore 6 mm. diametro; sepalis 4, subpatulis, brunneo-glandulosis, triangulari-ovatis, acutis, 4 mm. longis; petalis ovatis, 1 cm. longis, brunneo-punctatis; filamentis numerosis, 1.5 cm. longis.

BASILAN, Isabela de Basilan, *Ebalo 930,* January 5–18, 1941, locally known as *tubal.*

I know of no close allies among the Philippine and Malaysian species to this distinctly striking form. It is well characterized by its large, elongated leaves and its short, lateral inflorescences.

SYZYGIUM ECOSTULATUM (Elm.) comb. nov.

Eugenia ecostulata Elm., Leafl. Philip. Bot. **4** (1912) 1428; Merr., Enum. **3** (1923) 165.

A species still known only from the type collection, *Elmer 13102,* from Palawan.

SYZYGIUM ELLIPTIFOLIUM (Merr.) comb. nov.

Eugenia elliptifolia Merr., Philip. Jour. Sci. **18** (1921) 291; Merr., Enum. **3** (1923) 165.

A species still known only from the two original collections from Polillo and Catanduanes, *Bur. Sci. 30518 Ramos, Warburg 13941.*

SYZYGIUM ELLIPTILIMBUM (Merr.) Merr. and Perr.

Syzygium elliptilimbum Merr. and Perr., Mem. Am. Acad. Arts Sci. **18** (1939) 187. (Mem. Gray Herb. 4:187).

Eugenia elliptilimba Merr., Jour. Straits Branch Roy. As Soc. **77** (1917) 211, Enum. 3 (1923) 165; Quis., Philip. Jour. Sci. **41** (1930) 29. descr. fruct.

Eugenia suluensis Merr., Philip. Jour. Sci. **30** (1926) 416 *syn. nov.*

This was originally described from Bornean specimens. It occurs in the Sulu Archipelago (*E. suluensis* Merr.), and in southeastern Mindanao (Zamboanga). The type of *Eugenia suluensis* Merr. was *Bur. Sci. 43916 Ramos* and *Edaño* from

Jolo. Other specimens are *Bur. Sci. 36604, 36605, 36638 Ramos* and *Edaño* from Zamboanga Province, Mindanao.

SYZYGIUM ESCRITORII nom. nov.

Eugenia euphlebia Merr., Philip. Jour. Sci. 10C (1915) 217, Enum. 3 (1923) 166, non Hayata (1913).

A species still known only from Quezon Province, Luzon. The type is *Bur. Sci. 20782 Escritor.*

The original specific name selected by me is invalidated by the earlier *Eugenia euphlebia* Hay. Ic. Pl. Formos. 3 (1913) 119= *Syzygium euphlebium* (Hay.) Mori, Trans. Nat. Hist. Soc. Formosa 28 (1938) 439, a Formosan species.

SYZYGIUM EVERETTII (C. B. Rob.) comb. nov.

Eugenia everettii C. B. Rob., Philip. Jour. Sci. 4C (1909) 371; Merr., Enum. 3 (1923) 166, excl. *Eugenia irosinensis* Elm.)

Eugenia pallidifolia Merr., Philip. Jour. Sci. 10C (1915) 222.

Central to southern Luzon, Leyte, Negros, Mindanao. An additional collection is *P. N. H. 2743 Sulit* from Sorsogon Province, Luzon. It has been recorded, with doubt as occurring in the Talaud Islands south of Mindanao. *Eugenia irosinensis* Elm. is apparently a distinct species, my reduction of it in 1923 being erroneous.

SYZYGIUM FASTIGIATUM (Blume) Merr. and Perr.

Syzygium fastigiatum (Blume) Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 152. (Mem. Gray Herb. 4:152), *cum syn.*

Calyptranthes fastigiata Blume, Bijdr. (1826) 1090.

Caryophyllus fastigiatum Blume, in DC. Prodr. 3 (1828) 262.

Eugenia bracteolata Wight, Ill. 2 (1841) 15, Ic. 2 (1843) *pl. 531.*

Eugenia confertiflora Koord. and Val., Meded. Lands Plant. 40 (1900) 106; (Bijdr. Boomsoort. Java 6:106); Atlas Baumart. Java 3 (1915) *pl. 480,* non A. Gray (1854).

Eugenia fastigiata Koord. and Val., op. cit. 104; Atlas. *pl. 479;* Henders. Gard. Bull. Singapore 12 (1949) 190. *fig. 36c.*

Eugenia elmeri Merr., Univ. Calif. Publ. Bot. 15 (1919) 218.

Eugenia sablanensis Elm., Leafl. Philip. Bot. 1 (1908) 228; Merr., Enum. 3 (1923) 176, incl. var. *ramulosa* Elm.; op. cit. 4 (1912) 1408, *syn. nov.*

Widely distributed in the Philippines, and outside of that Archipelago extending from Tenasserim, Burma, Siam and Indo-China through the Malay Peninsula to Sumatra, Java, and Borneo. It is suspected that the synonymy as given above, and by other authors, will be increased rather than diminished as collections now available are more thoroughly studied. The Moluccan *Eugenia rumphii* Merr. Interpret. Rumph. Herb. Amb. (1917) 396, with larger flowers like those of *Syzygium densinervium* (Merr.) Merr., and somewhat smaller leaves than the

species here considered, belongs in this group. The Index Kewensis entry *Eugenia confertifolia* A. Gray is an error for E. *confertiflora* A. Gray.

SYZYGIUM FENICIS (C. B. Rob.) comb. nov.

Eugenia fenicis C. B. Rob., Philip. Jour. Sci. 4C (1909) 355; Merr., Enum. 3 (1923) 166.

The type was from the Babuyan Islands, *Bur. Sci. 4065 Fenix, Bur. Sci. 29680 Ramos* from Rizal Province, Luzon is referred here.

SYZYGIUM FILIPES sp. nov.

Ut videtur arbor parva, glabra, ramis ramulisque gracilibus, teretibus, ultimis vix 1 mm. diametro, vetustioribus griseis, rigidis; foliis subellipticis vel oblongo-ellipticis, coriaceis, supra olivaceis vel brunneo-olivaceis, supra nitidis, subtus pallidioribus et minute subdense puncticulatis, 5–7 cm. longis, 1.5–3 cm. latis, longe graciliter subabrupte caudato-acuminatis, acuminibus 1-2 cm. longis, obtusis, 1.5–2 mm. latis, basi acutis vel late acutis; nervis utrinque numerosissimis, parallelis, patulis, inter se circiter 1 mm. distantibus, vix perspicuis, in venam intramarginalem 1 mm. a margine confluentibus; petiolo 6–10 mm. longo; inflorescentiis in axillis superioribus, haud terminalibus, laxissimis, trichotomis, gracilibus, pedunculatis, paucifloris, 5–9 cm. longis, 3–4 cm. latis, pedunculo circiter 3.5 cm. longo, ramis primariis 1.5–2 cm. longis, gracilibus, fere filiformibus; floribus inter minores, in ramis primariis et secundariis in triadibus dispositis, bracteis lanceolatis, deciduis, circiter 1 mm. longis, bracteolis similibus, minoribus; calycibus 3–3.5 mm. longis, vix 1.5 mm. diametro, truncatis vel margine obscure undulatis, deorsum gradatim angustatis, sessilibus vel brevissime pedicellatis; petalis 4, circiter 1 mm. diametro, imbricatis sed vix cohaerentibus.

MINDANAO, Surigao Province, *Bur. Sci. 34723 Ramos* and *Edaño*, June, 1919, distributed as *Eugenia cymosa* Lam., var. Type in the herbarium of the Arnold Arboretum, duplicate in the U. S. National Herbarium.

Strikingly characterized by its very slender branches and branchlets, its closely veined, conspicuously caudate-acuminate leaves which are rather densely puncticulate beneath, and especially by its very lax, few flowered inflorescences which are borne in the upper leaf axils, the peduncles and branches being filiform. The small, almost clavate flowers are not quite mature. I have not been able to refer this to any described Malaysian or

Philippine form. Its original identification with Lamarck's species was erroneous and the Malaysian material formerly referred to *Eugenia cymosa* Lam. for the most part represents *Syzygium syzygioides* (Miq.) Merr. and Perry. The true alliance of *Syzygium filipes* Merr. appears to be with the Sumatran, Javan and Bornean *Syzygium rostratum* (Blume) DC. but the very lax inflorescences forbid this disposition of the Philippine form. *Eugenia cymosa* Lam. does not occur in the Indo-Malaysian region; its type was from Mauritius.

SYZYGIUM FISCHERI (Merr.) comb. nov.

Eugenia fischeri Merr., Philip. Jour. Sci. **10C** (1915) 218, Enum. **3** (1923)166.

A species still known only from three collections, Camarines Province, Luzon, *For. Bur. 21755 Fischer, 21228 Alvarez, 21153 Miranda.*

SYZYGIUM FOXWORTHYI (Elm.) comb. nov.

Eugenia foxworthyi Elm., Leafl. Philip. Bot. 4 (1912) 1414; Merr., Enum. **3** (1923) 166.

A species still known only from the type collection, *Elmer 11280* from Davao, Mindanao.

SYZYGIUM GARCIAE (Merr.) comb. nov.

Jambosa garciae Merr., Manila, Govt. Lab. Publ. **17** (1904) 36.
Eugenia garciae Merr. ex C.B. Rob., Philip. Jour. Sci. 4C (1900) 399; Enum. **3** (1923) 166.

A very strongly marked species extending from Mindoro and southern Luzon (Sorsogon), to Mindanao. A recent collection is *P.N.H. 2080 Quisumbing* from Baler, Quezon Province, Luzon.

SYZYGIUM GIGANTIFOLIUM (Merr.) comb. nov.

Eugenia gigantifolia Merr. ex C. B. Rob., Philip. Jour. Sci. 4C (1909) 350; Merr., Enum. 3 (1923) 166.

A species recorded from Culion, Mindoro, Mindanao, and Basilan. *Bur. Sci. 46224 Edaño* from Panay apparently belongs here.

SYZYGIUM GITINGENSE (Elm.) comb. nov.

Eugenia gitingensis Elm., Leafl. Philip. Bot. 4 (1912) 1409; Merr., Enum. 3 (1923) 166.

LUZON (Cagayan, Camarines), Sibuyan. The type is *Elmer 12078* from Sibuyan.

SYZYGIUM GLAUCICALYX (Merr.) comb. nov.

Eugenia glaucicalyx Merr., Manila, Govt. Lab. Publ. 35 (1906) 50, Enum. 3 (1933) 166.

LUZON (Bataan, Laguna), Culion, Palawan, *Merrill 570,626, 3949, For. Bur. 817, 826, Borden, 7359, 6241, 19282 Curran.*

This may be the Philippine representative of the Indo-Malaysian *Syzygium zeylanicum* (Linn.) DC. (*Eugenia spicata* Lam.), although as Henderson notes, Gard. Bull. Singapore 12 (1949) 233, it is closer to the allied *Syzygium gratum* Wall. (*Eugenia grata* Wight), which extends from Assam and Burma to Malay Peninsula and Sumatra. The Philippine form is an inland, usually sylvan species, rather than a coastal one.

SYZYGIUM GLOBOSUM (Elm.) comb. nov.

Eugenia globosa Elm., Leafl. Philip. Bot. 4 (1912) 1404; Merr., Enum. 3 (1923) 167.

Eugenia banaba Elm., op. cit. 1443; Merr. op. cit. 159, *syn. nov.*

A comparison of *Elmer 11702, 11327* from Davao, Mindanao, the two collections on which *Eugenia globosa* Elm. was based with *Elmer 12146* from Sibuyan, the type collection of *Eugenia banaba* Elm., indicates rather clearly that but a single species is represented. An additional collection is *Vidal 2765* (Herb. Kew.) from Panay.

SYZYGIUM GRACILE (Korth.) Amsh.

Syzygium gracile (Korth.) Amsh., in Backer, Beknopte Fl. Jav. *IVb (1) 6:* Fam. 98 Sept. (1944) 22, Blumea 5 Dec. 31 (1945) 500.

Jambosa gracilis Korth., Nederl. Kruidk. Arch. 1 (1847) 202.

Myrtus glabrata Blume, Bijdr. (1788) 1088. 1826, non Sw.

Clavimyrtus virens Blume, Mus. Bot. Lugd. Bat. 1 (1849) 114.

Clavimyrtus marginata Blume, op. cit. 115.

Jambosa marginata Miq., Fl. Ind. Bat. 1 (1855) 428.

Jambosa virens Miq., l. c.

Eugenia fusiformis Duthie, in Hook. f. Fl. Brit. Ind 2 (1878) 479.

Eugenia blumeana O. Kuntze, Rev. Gen. Pl. 1 (1891) 239.

Eugenia virens Koord. and Val., Meded. Lands Plant. 40 (1900) 113 (Bijdr. Boomsoort. Java 6:113); Henders. Gard. Bull. Straits Settl. 12 (1949) 249, *fig. 47a.*

Eugenia clavimyrtus Koord. and Val., l. c.

Eugenia leptogyna C. B. Rob., Philip. Jour. Sci. 4C (1909) 368; Merr., Enum. 3 (1923) 186.

Syzygium fusiforme Merr. and Perr., Mem. Amer. Acad. Arts Sci. 18 (1939) 176; (Mem. Gray Herb. 4:176).

Central Luzon (Laguna) to Mindoro, Palawan, Panay Negros, and Mindanao. A recent Philippine collection is *Philip. Nat. Herb. 2731 Sulit* from Sorsogon Province, Luzon. A very characteristic species represented by many collections, extending to Borneo, Java, and the Malay Peninsula.

This strongly marked species has acquired an extensive synonymy since it was first very inadequately described by Blume from Javan specimens in 1826. As is not infrequently

the case when it appeared in collections from the Malay Peninsula it was redescribed as a new species, and still later when it was found in the Philippines it was again described as another new species. Mr. Henderson was fortunately able to examine Blume's type of *Clavimyrtus virens* Blume (1849), and I examined it in 1950. However, Dr. Amashoff noted in 1945 that the oldest valid specific name for the species in *Syzygium* stems from *Jambosa gracilis* Korth. (1847), and after having also seen the Korthals type, I accept her conclusions. The synonymy as given above is taken largely from Henderson and Amshoff.

Koorders and Valeton took their descriptive data from Blume and thought that the species might not be distinct from their very different *Eugenia clavimyrtus* Koord. and Val. Mr. Henderson was fortunately able to examine Blume's type and I here accept his interpretation of it. I have not, however, been able to locate any consideration of Blume's name in Amshoff's recent revision of the Javan species in Backer's Beknopte Flora van Java (1944), yet Blume's type was from Java.

SYZYGIUM GRISEUM (C. B. Rob.) Airy Shaw.

Syzygium griseum (C. B. Rob.) Airy Shaw, Kew Bull. (1949) 124.
Eugenia grisea C. B. Rob., Philip Jour. Sci. 4C (1909) 395; Merr., Enum. 3 (1923) 167.

A species recorded from northern to southern Luzon (Cagayan to Camarines), Guimaras, and Leyte; also in Borneo, fide Airy Shaw. Additional Philippine collections are *Bur. Sci. 22011 Ramos* from Camarines Province, *For. Bur. 28881 Cenabre* and *Aglear,* Cagayan Province, *P. N. H. 2284 Quisumbing,* Quezon (Tayabas) Province, *Loher 350, 2485* (Herb. Kew.) from Central Luzon, *Loher 2485, 7262* (Herb. Kew.) Rizal Province, and *P. N. H. 6267 Sulit* from Samar.

As Robinson and Airy Shaw note, this species is apparently closely allied to the Javan *Eugenia jamboloides* Koord. and Val. Meded. Lands Plantent. **40** (1900) 136. (Bijdr. Boomsoort. Java **6**:136) *Syzygium racemosum* (Blume) DC. Prodr. **3** (1828) 261. (*Calyptranthes racemosa* Blume, Bijdr. (1826) 1089).

SYZYGIUM HALOPHILUM (Merr.) comb. nov.

Eugenia halophila Merr., Enum. 3 (1923) 167.
Eugenia maritima Merr., in Philip. Jour. Sci. 10C (1915) 212, non DC. (1828).

The type, *For. Bur. 13760* (not *13670* as cited in the original description) *Foxworthy, Demesa* and *Villamil,* was from

Zamboanga, Mindanao, but sterile material from Luzon (Cagayan, Camarines) and Leyte may represent the same species. It is also recorded from Banguey Island, British North Borneo.

SYZYGIUM HUGHCUMINGII sp. nov.

Ut videtur arbor parva, glabra, ramis teretibus, pallide brunneis, ramulis ultimis circiter 1 mm. diametro, sulcato-angulatis vel obscure 4–carinatis; foliis subellipticis vel oblongo-ellipticis, 12–14 cm. longis, 4–6 cm. latis, breviter obtuse acuminatis, basi acutis, olivaceo-brunneis, supra subnitidis, subtus paullo pallidioribus, obscure puncticulatis, firmiter chartaceis, vix coriaceis, breviter (3–4 mm.) petiolatis; nervis primariis utrinque circiter 14, inter se plerumque 6–9 mm. distantibus, distinctis, patulis vel leviter adscendentibus, in venam submarginalem circiter 2 mm. a margine confluentibus, secundariis minus distinctis, omnibus cum reticulis sublaxis subtus subelevatis; inflorescentiis terminalibus, sessilibus vel breviter pedunculatis, 4–5 cm. longis latisque, plerumque e basi ramosis, ramis, primariis 1–2.5 cm. longis; floribus inter minores, sessilibus, in ramulis ultimis in capitulis 5–10-floris dispositis; bracteis inferioribus sublanceolatis, acuminatis, superioribus brevioribus, bracteolis minutis, obscuris, deciduis; calycibus 4 mm. longis, obscurissime striatulis, ore circiter 3 mm. diametro, truncato, deorsum angustatis sed vix pseudostipitatis; petalis calyptratim caducis, filamentis numerosis; stylo circiter 5 mm. longo.

LUZON, Camarines Sur Province, *Hugh Cuming 1498*, type in herb. British Museum; also from Laguna Province, *N. J. Anderson s. n.* January, 1853, Stockholm and Arnold Arboretum herbaria. Another collection, with somewhat narrower leaves than the type is *Micholitz s.n.*, in the Kew Herbarium with merely the entry "Philippines"; this probably came from either southern Quezon (Tayabas) Province or from Camarines, see below.

A species clearly allied to *Syzygium striatulum* (C. B. Rob.) Merr., but distinguished by several characters, among these being its more distant and essentially spreading rather than distinctly ascending nerves, and its much smaller flowers, which, instead of being arranged in triads, are crowded into small 5– to 10-flowered capitula at the tips of the ultimate branchlets of the inflorescences. The Cuming number was unlocalized on the British Museum sheet. It came from Camarines Sur Province, Luzon (see Merrill, Philip. Jour. Sci. **30** (1926) 175). The unlocalized Micholitz specimen undoubtedly came

from either Camarines or southern Quezon Province, Luzon, as these particular areas were the favorite places in the Philippines where that professional orchid collector operated.

SYZYGIUM HUTCHINSONII (Merr.) comb. nov.

Eugenia hutchinsonii Merr. ex C. B. Rob., Philip. Jour. Sci. 4C (1909) 376; Merr., Enum. 3 (1923) 167.

Still known only from the type collection, *For. Bur. 4026 Hutchinson* from Basilan.

SYZYGIUM ILOCANUM (Merr.) comb. nov.

Eugenia ilocana Merr., Philip. Jour. Sci. 18 (1921) 291, Enum. 3 (1923) 167.

Still known only from the two original collections from Ilocos Norte Province, Luzon, *Bur. Sci. 27420, 32821 Ramos.*

SYZYGIUM INCARNATUM (Elm.) Merr. and Perr.

Syzygium incarnatum (Elm.) Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 195. (Mem. Gray Herb. 4: 195).

Eugenia incarnata Elm., Leafl. Philip. Bot. 4 (1912) 1416.

The type of this was *Elmer 13231* from Palawan, a fruiting specimen. In association with Dr. Perry a number of Bornean collections were referred to this species, I still think correctly so. However, we also reduced to this species *Eugenia punctulata* King (1901), non F. M. Bailey (1896) (*Syzygium punctulatum* Wall. (1831), *nomen nudum*), of the Malay Peninsula. Henderson, Gard. Bull. Singapore 12 (1949) 168, does not agree with this reduction and proposed *Eugenia cerina* Henders. as a new name for the Malay Peninsula form. The two species are manifestly closely allied, but additional Philippine collections are needed to settle the point at issue. In any case *Syzygium incarnatum* (Elm.) Merr. and Perr. is the correct name for the Philippine form.

SYZYGIUM INCRASSATUM (Elm.) comb. nov.

Eugenia incrassata Elm., Leafl. Philip. Bot. 2 (1901) 581; Merr., Enum. 3 (1923) 167.

Eugenia camiguinensis Merr., Philip. Jour. Sci. 7C (1912) 314, Enum. 3 (1923) 161, *syn. nov.*

A species manifestly allied to *S. densinervium* Merr., but with smaller, very differently shaped, distinctly glandular-punctate leaves. I am now convinced that *Eugenia camiguinensis* Merr. is the same as *Syzygium incrassatum* (Elm.) Merr. and accordingly reduce it to synonymy. The species as thus constituted is known from the two original collections, *Elmer 9187* from Lucban, Mount Banahao, Quezon Province, Luzon (at least some of the duplicates of this number were distributed with Dumaguete, Negros labels; but the Lucban lo-

cality is correct, as it was checked on the typed copy of Elmer's notes in the Arnold Arboretum library), typifies *S. incrassatum* (Elm.) Merr., and *Merrill Philip. Pl. 1175* from Camiguin de Misamis Island, collected by Ramos, typifies *Eugenia camiguinensis* Merr. A third and more recent collection is *P. N. H. 6340 Sulit* from Samar, May 17, 1948.

SYZYGIUM INTUMESCENS (C. B. Rob.) comb. nov.

Eugenia intumescens C. B. Rob., Philip. Jour. Sci. **4C** (1909) 401; Merr., Enum. 3 (1923) 167.

Northern Luzon (Isabela) to Masbate, Leyte, and Camiguin de Misamis. An additional collection is *Bur. Sci. 17578 Ramos* from Samar.

SYZYGIUM IROSINENSE (Elm.) comb. nov.

Eugenia irosinensis Elm. ex Merr., Enum. **3** (1923) 166, *nom.* sub *Eugenia everettii* Merr., Elm., Leafl. Philip. Bot. **10** (1939) 3767, *descr. angl.*

Jambosae, Arbor glabra, circiter 8 m. alta, ramis ramulisque teretibus, plerumque pallidis, ultimis 1–1.5 mm. diametro; foliis ovatis, elliptico-ovatis, vel oblongo-ovatis, subchartaceis, 8–11 cm. longis, 3–6 cm. latis, sicco supra plerumque subolivaceis vel pallidis, subtus pallidioribus et minute atro-puncticulatis, basi late acutis vel subrotundatis, apice distincte sed obtuse acuminatis; nervis primariis utrinque 4–6, distantibus, subtus elevatis, distinctis, curvatis, arcuato-anastomosantibus, reticulis primariis laxis; inflorescentiis terminalibus et in axillis superioribus, pedunculatis (pedunculo 2–5 cm. longo fide Elmer), ramis paucis, pedicellis sub fructu 8–15 mm. longis; fructibus (immaturis) cyathiformibus, basi late rotundatis, saltem 1.5 cm. longis latisque, tubo producto, margine distincte recurvatis; stylo fere 2 cm. longo; floribus ignotis.

LUZON, Sorsogon Province, Mount Bulusan, *Elmer 15600* (type), *15274, 16341,* November, 1915 and June, 1916, in forest at medium altitudes.

In 1923 I cited Elmer's then unpublished binomial as a synonym of *Eugenia everettii* C. B. Rob. In Leafl. Philip. Bot. **10** (1939) 3808, Elmer listed his no. *16341,* distributed as *Eugenia irosinensis* Elm., which I believe it to represent, as *E. everettii* C. B. Rob. I take *Syzygium irosinense* (Elm.) Merr. to be a species distinct from but manifestly allied to *Syzygium everettii* (C. B. Rob.) Merr.; it is safely not closely allied to *Syzygium balerense* (C. B. Rob.) Merr., as Elmer suggested. It is distinguished from *Syzygium everettii* (C. B. Rob.) Merr., among other characters, by its usually peduncled inflorescences (fide Elmer), its distinctly pedicelled fruits, and especial-

ly by its fewer nerved leaves. I have examined six sheets of the Elmer numbers cited but all of these are unsatisfactory, with detached fragmentary infructescences and detached fruits, the latter very immature—in fact just beyond anthesis. This is a case where I should not have attempted to characterize a species on the basis of fragmentary, rather poorly prepared specimens had not Mr. Elmer published his English description in 1939. The present publication of an admittedly unsatisfactory Latin description at least validates Elmer's binomial.

SYZYGIUM ISABELENSE (Quis.) comb. nov.

Eugenia isabelensis Quis., Philip. Jour. Sci. **41** (1930) 339, *fig. 13*.

This species was based on *Bur. Sci. 46973, 47218 Ramos* and *Edaño*, from Isabela Province, Luzon. Additional collections are *For. Bur. 18492 Alvarez* from Cagayan Province, and *Bur. Sci. 33455 Ramos* and *Edaño* from Camarines Province, Luzon, the latter distributed as *Eugenia dura* Merr. fol. major.

SYZYGIUM IWAHIGENSE (Elm.) comb. nov.

Eugenia iwahigense Elm., Leafl. Philip. Bot. **4** (1912) 1417; Merr., **6** Suppl. (1931) 116.

Still known only from the type collection, *Elmer 12743* (not *12742*), from Palawan.

SYZYGIUM JAMBOS (Linn.) Alston

Syzygium jambos (Linn.) Alston, in Trimen Handbook Fl. Ceylon **6** Suppl. (1931) 116.

Eugenia jambos Linn., Sp. Pl. (1753) 470; Merr., Enum. **3** (1923) 168, *cum syn.*

Widely distributed in the Philippines, cultivated and naturalized, of prehistoric introduction here. Native of the Indo-Malaysian region, now pantropic. Its present wide geographic distribution is largely due to its having been disseminated by man at an early period in the Old World, for its edible fruits. In parts of Central America it is now gregarious over considerable areas.

SYZYGIUM LACUSTRE (C. B. Rob.) comb. nov.

Eugenia lacustris C. B. Rob., Philip. Jour. Sci. **4C** (1909) 377; Merr., Enum. **3** (1923) 168.

This was based on *Clemens 299* from Lanao Province, Mindanao, the species again collected in the same region by *For. Bur. 23316 Agama*. A recent collection is *P.N.H. 10101 Sulit* from Bukidnon Province, Mindanao.

SYZYGIUM LANCILIMBUM (Merr.) comb. nov.

Eugenia lancilimba Merr., Philip. Jour. Sci. **20** (1922) 413, Enum. **3** (1923) 168.

A species still known only from the original two collections, *Bur. Sci. 36934, 36935 Ramos* and *Edaño*, from Zamboanga Province, Mindanao.

SYZYGIUM LEUCOXYLUM Korth.

Syzygium leucoxylum Korth., Nederl. Kruidk. Arch. 1 (1847) 203; Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 193. (Mem. Gray Herb. 4: 193).

Eugenia leucoxylon Miq., Anal. Bot. Ind. 1 (1850) 26, *pl. 9;* Henders. Gard. Bull. Singapore 12 (1949) 235, *fig. 44j.*

Singapore 12 (1949) 235, *fig. 44j.*

Eugenia verecunda Duthie, in Hook. f. Fl. Brit. Ind. 2 (1878) 496.

Eugenia brevistylis C. B. Rob., Philip. Jour. Sci. 6C (1911) 347; Merr., Enum. 3 (1923) 160.

This species extends from the Malay Peninsula, the Anambas Islands and Borneo to the Philippines. In the latter group it had previously been recorded from Luzon (Quezon Province), Sibuyan, Leyte, Tinago, Dinagat, and Mindanao. Recent collections are *P. N. H. 3708 Salvosa* from Palasan, and *P. N. H. 131, 213 Edaño* from Palawan.

SYZYGIUM LEYTENSE (Elm.) comb. nov.

Eugenia leytensis Elm., Leafl. Philip. Bot. 1 (1908) 329; Merr., Enum. 3 (1923) 169.

Eugenia samarensis Merr., Philip. Jour. Sci. 10C (1915) 223, Enum. 3 (1923) 176, *syn. nov.*

Eugenia sarcocarpa Merr., Philip. Jour. Sci. 18 (1921) 295, Enum. l. c., *syn. nov.*

Now represented by seven individual collections from Leyte and Samar. The type of *Eugenia sarcocarpa* Merr. is a fruiting specimen and I am now convinced that both this species and *E. samarensis* Merr. are the same as *E. leytensis* Elm.

SYZYGIUM LLANOSII (Merr.) comb. nov.

Eugenia llanosii Merr., Philip. Jour. Sci. 10C (1915) 220, Merr., Enum. 3 (1923) 169.

A species still known only from the type collection, *Merrill 9704* from Benguet Province, Luzon.

SYZYGIUM LONGIFLORUM Presl

Syzygium longiflorum Presl, Bot. Bemerk. (1844) 70.

Eugenia longiflora F.–Vill., Novis. App. Fl. Filip. (1880) 86; Merr., Enum. 3 (1923) 169; Henders., Gard. Bull. Singapore 12 (1949) 159, *fig. 30 e-f., cum syn.*

Eugenia marivelesensis Merr., Philip. Jour. Sci. 1 Suppl. (1906) 106.

Eugenia miquelii Elm., Leafl. Philip. Bot. 4 (1912) 1441.

Myrtus lineata Blume, Bijdr. (1826) 1087, non Sw. (1800).

Eugenia lineata Dutchie Fl. Brit. Ind. 2 (1878) 487.

Jambosa rubricaulis Miq., Fl. Ind. Bat. 1 1 (1855) 429.

Jambosa teysmanni Miq., l.c.

Eugenia rubricaulis Duthie., in Hook f. Fl. Brit. Ind. **2** (1878) 487.
Eugenia simularis King, Jour. As. Soc. Bengal **70** (2) (1901) 128. (Mater. 3:558), pro parte.
Eugenia longicalyx Ridl., Jour. Bot. **68** (1930) 11.
Syzygium lineatum Merr. and Perr., Jour. Arnold Arb. **19** (1938) 109. Mem. Am. Acad. Arts. Sci. **18** (1939) 172. (Mem. Gray Herb. 4:172).

Throughout the Philippines in most islands and provinces, Borneo, Java, Sumatra, Malay Peninsula, Siam, Indo-China.

I now accept Presl's specific name as the proper one for this widely distributed species, as did Henderson, for the reason that the oldest binomial involved, *Myrtus lineata* Blume (1826), was invalidated by the earlier *M. lineata* Swartz (1800).

SYZYGIUM LONGIPEDICELLATUM (Merr.) comb. nov.

Eugenia longipedicellata Merr., Manila, Govt. Lab. Publ. **17** (1904) 37.
Eugenia longipedicellata C. B. Rob., Philip. Jour. Sci. **4C** (1909) 349; Merr., Enum. **3** (1923) 169.

A very strongly characterized species with long slender peduncles and pedicels originally described from specimens collected at Baler, east coast of Tayabas (now Quezon) Province, Luzon. Now represented by two additional collections from the east coast of Quezon Province, *Bur. Sci. 54324 Ramos* and *Edaño*, and *P. N. H. 4617 Alcasid* and *Edaño*.

SYZYGIUM LONGISSIMUM (Merr.) comb. nov.

Eugenia longissima Merr., Manila, Govt. Lab. Publ. **35** (1906) 50, Enum. **3** (1923) 169.

Previously known only from two collections, *Elmer 6218* from Benguet and *Bur. Sci. 5124 Ramos* from Zambales Province, Luzon. A third collection is *Bur. Sci. 46859 Ramos* and *Edaño* from Isabela Province, Luzon.

SYZYGIUM LONGISTYLUM (Merr.) comb. nov.

Eugenia longistyla Merr., Philip. Jour. Sci. **10C** (1915) 220, Enum. **3** (1923) 169.

A species known only from two Cagayan Province, Luzon, collections, *For. Bur. 17910 Barros* (type), and *For. Bur. 24258 Bernardo.*

SYZYGIUM LOROFOLIUM sp. nov.

§ *Jambosae.* Ut videtur arbor parva, glabra, ramis ramulisque teretibus, brunneis vel purpureo-brunneis, ultimis 1 mm. diametro; foliis stricte oppositis, auguste oblongis vel oblongo-lanceolatis, utrinque plus minusve angustatis, obtusis vel obscure obtuse acuminatis, basi acutus vel obtusis 9–15 cm. longis, 2–3 cm. altis, firmiter chartaceis vel subcoriaceis, opacis, oli-

vaceis vel olivaceo-viridibus, subtus plerumque paulo pallidioribus, plus minusve puncticulatis; nervis primariis utrinque 8—10, curvato-adscendentibus, distantibus, arcuato-anastomasantibus, supra leviter impressis, subtus distinctis, elevatis, in venam intramarginalem 2–4 mm. a margine confluentibus, secundariis reticulisque minus conspicuis; petiolo 2–5 mm. longo; inflorescentiis pedunculatis, paucifloris, terminalibus axillaribusque, 5–7 cm. longis, pedunculo sub anthesin 2–4 cm. longo; bracteolis minutis, vix 0.5 mm. longis, deciduis; floribus plerumque 3, circiter 2.5. cm. longis latisque, ut videtur albidis; calycibus infundibuliformibus, deorsum angustatis, tubo 1 cm. longo, ore 1 cm. diametro, lobis 4, late rotundatis, 5–7 mm. latis, circiter 3 mm. longis, plus minusve puncticulatis, persistentibus; petalis ellipticis vel obovatis, rotundatis, circiter 1 cm. longis; filamentis quam petalis longioribus; fructibus turbinatis, 2 cm. diametro.

LUZON, Quezon Province, Guinayangan, *For. Bur. 20889 Escritor,* March-April, 1913 (type in the U. S. National Herbarium) ; Kabibihan, *Bur. Sci. 13288 Ramos,* February-March, 1911 (flowers immature), herb. Mus. Brit. Samar, without locality, *For. Bur. 21051 Sherfeesee, Cenabre* and *Cortes,* April, 1914, flowers immature, U. S. National Herbarium, "Samar," *Cuming 1903,* herb. Mus. Brit. with mature flowers and fruits.

In its vegetative characters it is somewhat suggestive of *Syzygium polypetalum* (Wall.) comb. nov. (*Eugenia polypetala* Wall. List No. *3616,* (1830) ; Wight, Ill. Bot. Ind. 2 (1841) 14; *Eugenia angustifolia* Roxb., non Lam.) of India, but is not closely allied to that species.

A species well characterized by its slenderly peduncled, few flowered, mostly terminal (some times lateral) inflorescences, its medium or rather large sized flowers and especially by its narrow, elongated, somewhat strap-shaped leaves. All of the specimens were distributed merely as *Eugenia* sp. The Cuming number is not localized in his list of localities (see Philip. Jour. Sci. **30** (1926) 175), falling in the group of unlocalized numbers between *1858* and *2153.* The label bears merely the number and the locality Samar. As what is manifestly the same species has since been collected in Samar, the indicated locality is probably correct. In some respects the species suggests *Syzygium lancilimbum* (Merr.) Merr., but the inflorescences are totally different while in vegetative characters the two do not conform.

SYZYGIUM LUTEUM (C. B. Rob.) comb. nov.

Eugenia lutea C. B. Rob., Philip. Jour. Sci. 6C (1911) 350; Merr., Enum. 3 (1923) 170.

A species growing along river banks in Quezon Province, Luzon, *For. Bur. 18635 Darling* and *Bur. Sci. 13201 Foxworthy* and *Ramos. Bur. Sci. 20784 Escritor* from the same province is a form of this with somewhat smaller leaves than the type.

SYZYGIUM LUZONENSE (Merr.) comb. nov.

Eugenia luzonensis Merr., Manila, Govt. Lab. Publ. 17 (1904) 37, Enum. 3 (1923) 170.

A widely distributed species extending from Cagayan Province, Luzon, to Mindoro, Masbate, Negros, and Mindanao. A recent collection is *P. N. H. 1643 Alcasid* from Laguna Province, Luzon.

SYZYGIUM MACGREGORII (C. B. Rob.) comb. nov.

Eugenia macgregorii C. B. Rob., Philip. Jour. Sci. 4C (1909) 367; Merr., Enum. 3 (1923) 170.

A widely distributed species extending from southern Luzon Samar and Leyte to Palawan and Mindanao. Two recent collections are *Philip. Nat. Herb. 2048, 2052 Quisumbing* from Calicoan Island near Samar. Quezon and Bulacan collections distributed as representing this species are now referred to *Syzygium affine* Merr., supra.

SYZYGIUM MAINITENSE (Elm.) comb. nov.

Eugenia mainitensis Elm., Leafl. Philip. Bot. 4 (1912) 1415; Merr., Enum. 3 (1923) 170.
Eugenia leucocarpa Merr., Philip. Jour. Sci. 11C (1916) 23.

This was previously known from Sorsogon Province, Luzon, and Mindanao. Additional recent collections are *P. N. H. 2699 Sulit* from Sorsogon Province, and *P. N. H. 6428, 6434 Sulit, 5849 Castro* from Samar. It is apparently closely allied to *Syzygium incarnatum* (Elm.) Merr. and Perr.

SYZYGIUM MALACCENSE (Linn.) Merr. and Perr.

Syzygium malaccense (Linn.) Merr. and Perr., Jour. Arnold Arb. 19 (1938) 215; Mem. Am. Acad. Arts Sci. 18 (1939) 154. (Mem. Gray Herb. 4:154), *cum. syn.*
Eugenia malaccensis Linn., Sp. Pl. (1753) 470; Merr., Enum. 3 (1923) 170. *cum. syn.;* Henders, Gard. Bull. Singapore 12 (1949) 46, *fig. 6a.*
Jambosa malaccensis DC., Prodr. 3 (1828) 286.

Widely distributed in the Philippines in cultivation, a prehistoric introduction from Indo-Malaysia; now planted in the tropical parts of both hemispheres.

SYZYGIUM MALAGSAM (Elm.) comb. nov.

Eugenia malagsam Elm., Leafl. Philip. Bot. **4** (1912) 1403; Merr., Enum. **3** (1923) 170.

Definitely known only from the type collection, *Elmer 11838* from Mindanao (Davao), but a recent collection with very young buds from Mount Halcon, Mindoro, *P. N. H. 3261 Edaño,* may belong here. This is apparently closely allied to *S. durum* (Merr.) Merr., but its fruits are nearly globose, not cylindric and more or less elongated.

SYZYGIUM MANANQUIL (Blanco) comb. nov.

Myrtus mananquil Blanco, Fl. Filip. (1837) 431; Merr., Enum. **3** (1923) 171, *cum. syn.*

Eugenia livida Elm., Leafl. Philip. Bot. **7** (1914) 2349.

A very characteristic species extending from northern Luzon to Mindoro, Leyte, and Mindanao.

SYZYGIUM MARTELINOI (Merr.) comb. nov.

Eugenia martelinoi Merr., Philip. Jour. Sci. **18** (1921) 306, Enum., **3** (1923) 171.

A species still known only from the type collection, *Bur. Sci. 35630 Martelino* and *Edaño* from Panay.

SYZYGIUM MEGALANTHUM (C. B. Rob.) comb. nov.

Eugenia megalantha C. B. Rob., Philip. Jour. Sci. **43** (1909) 374; Merr., Enum. **3** (1923) 171.

A species known only from Palawan; two additional recent collections are *P. N. H. 146, 254 Edaño* from Iwahig, Palawan, the type locality.

SYZYGIUM MEGISTOPHYLLUM nom. nov.

Eugenia megalophylla Merr., Philip. Jour. Sci. **27** (1925) 42, Enum. **3** (1923) 171. non *Syzygium megalophyllum* Merr. and Perr. (1939).

Still known only from the type collection, *Loher 13596,* from the Umirey region, Quezon Province, Luzon.

SYZYGIUM MELLIODORUM (C. B. Rob.) comb. nov.

Eugenia melliodora C. B. Rob., Philip. Jour. Sci. 4C (1909) 401; Merr., Enum. **3** (1923) 171.

Central Luzon (Laguna, Quezon) to Mindoro and Leyte. A recent collection is *P. N. H. 6482 Castro* from Polillo.

SYZYGIUM MERRILLII (C. B. Rob.) comb. nov.

Eugenia merrillii C. B. Rob., Philip. Jour. Sci. 4C (1909) 349; Merr., Enum. **3** (1923) 171.

A strongly marked species known only from Palawan and Sibuyan; an additional collection from the type locality in Palawan is *P. N. H. 130 Edaño.*

SYZYGIUM MERRITTIANUM (C. B. Rob.) comb. nov.

Eugenia merritiana C. B. Rob., Philip. Jour. Sci. 4C (1909) 171; Merr., Enum. 3 (1923) 171.
Eugenia lumboy Elm., Leafl. Philip. Bot. 4 (1912) 1431.

LUZON (Pangasinan to Albay), Mindoro, Sibuyan. Additional collections are *Vidal 2782* from Rizal Province, and *Vidal 2799* from Bataan Province, Luzon, both in Herb. Kew.

SYZYGIUM MIMICUM (Merr.) comb. nov.

Eugenia mimica Merr., Philip. Jour. Sci. 1 Suppl. (1906) 112; Merr., Enum. 3 (1923) 172.
Eugenia submimica Elm., Leafl. Philip. Bot. 4 (1912) 1438.

LUZON (Ilocos Norte to Quezon), Mindoro, Palawan, Sibuyan, Leyte, and Mindanao. Additional collections from near the type locality of *Eugenia submimica* Elm., in Palawan are *Ebalo 403* and *P. N. H. 211 Edaño*. Also referable here is *Cuming 958*, Pangasinan Province, Luzon, in herb. British Museum.

SYZYGIUM MINDORENSE (C. B. Rob.) comb. nov.

Eugenia mindorensis C. B. Rob., Philip. Jour. Sci. 4C (1909) 399; Merr., Enum. 3 (1923) 172.

LUZON (Batangas), Mindoro. The Palawan and Banguey records were apparently based on erroneously identified specimens.

SYZYGIUM MIRABILE (Merr.) comb. nov.

Eugenia mirabilis Merr., Philip. Jour. Sci. 20 (1922) 412, Enum. 3 (1923) 172.

MINDANAO (Zamboanga), *Bur. Sci. 36772, 37238, 37347 Ramos* and *Edaño*, cited in the original description. An additional collection is *Zwickey 127* from Lanao Province, Mindanao.

SYZYGIUM MIRANDAE (Merr.) comb. nov.

Eugenia mirandae Merr., Philip. Jour. Sci. 10C (1915) 221, Enum. 3 (1923) 172.

A species still known only from the type collection, *For. Bur. 21687 Miranda*, from Camarines Province, Luzon.

SYZYGIUM MULTINERVE (C. B. Rob.) comb. nov.

Eugenia multinervis C. B. Rob., Philip. Jour. Sci. 4C (1909) 352; Merr., Enum. 3 (1923) 172.

The type is *Cuming 1299* from Cagayan Province, Luzon, collected more than a century ago, and not re-collected in modern times. There are specimens in the Kew and British Museum herbaria which I have examined, the former sterile, the latter with the cauline inflorescences from small tubercles a striking characteristic of the species.

SYZYGIUM MULTIPUNCTICULATUM sp. nov.

Arbor glabra, 7–8 m. alta, ramis ramulisque pallidis, teretibus, ultimis circiter 1.5 mm. diametro; foliis numerosis, ellipticis vel elliptico-obovatis, 3–4 cm. longis, 1.5–2 cm. latis, rotundatis vel obtusis, basi acutis, coriaceis, in sicco supra brunneis, subtus pallidioribus, leviter nitidis, nervis numerosissimis, paralellis, obscuris, inter se circiter 1 mm. distantibus, supra subdense minute scrobiculato-puncticulatis, subtus glanduloso-puncticulatis; petiolo 4–6 mm. longo; inflorescentiis terminalibus, fasciculatis, plerumque 4–5, omnibus pedunculatis, opposite vel subverticillatim ramosis, ramulis plus minusve angulatis vel sulcatis, primariis plerumque 1.5 cm. longis, secundariis 5–10 mm. longis, trinis, pedunculo 6–10 cm. longo; floribus parvis, circiter 8 mm. longis in ramulis ultimis in triadibus dispositis, sessilibus, bracteis bracteolisque ut videtur minutis, deciduis; calycibus circiter 4 mm. longis, infundibuliformibus, deorsum angustatis, sursum 3 mm. diametro, lobis 4, latissime rotundatis, circiter 0.5 mm. longis et 1.5 mm. latis; petalis imbricatis, adhaerentibus, calyptram 3 mm. diametro formantibus.

SAMAR, Loquilocon, near Wright, *Philip. Nat. Herb. 6084 M. D. Sulit,* April 10, 1948, in forests, alt. 150 m., flowers white, fragrant, with the local name 'kalogkog'.

A species manifestly allied to *Syzygium mainitense* (Elm.) Merr. (*Eugenia mainitensis* Elm.; *E. leucocarpa* Merr.), but with smaller, more obscurely nerved leaves which are conspicuously pitted-puncticulate on the upper surfaces, and glandular-puncticulate beneath. Another recent collection, *Philip. Nat. Herb. 2699 M. D. Sulit,* from Mount Bulusan, Sorsogon Province, Luzon, its flowers very immature, has similarly small leaves, but they are more prominently nerved, and the nerves are more ascending. This for the present I place as a form of Elmer's species.

SYZYGIUM NITIDUM Benth.

Syzygium nitidum Benth., Hook. Lond. Jour. Bot. 2 (1843) 221. *Eugenia benthamii* A. Gray, Bot. Wikes U. S. Explor. Exped. (1854) 520; Merr., Enum. 3 (1923) 159.

Widely distributed in Luzon, extending to Mindoro and Mangsi Island, near Borneo; type from Tobie [Jobi] Island, Geelvink Bay, New Guinea.

Perhaps more than one species is included in the rather numerous Philippine collections that have been distributed as representing *Eugenia benthamii* A. Gray, the valid name in

Eugenia because of the earlier *Eugenia nitida* Vell.; in *Syzygium* Bentham's original name is valid. Presumably the type from Jobi Island was a low altitude plant as was certainly the Mangsi collection of the U. S. Wilkes Exploring Expedition that Gray considered. I think these two collections undoubtedly represent a single species but it is 40 years since I compared the two at Kew, and at that time I was not very familiar with the differential specific characters in this difficult genus. It may be that some of the inland Philippine collections from medium and even fairly high altitudes represent a different species.

SYZYGIUM OBLANCEOLATUM (C. B. Rob.) comb. nov.

Eugenia oblanceolata C. B. Rob., Philip. Jour. Sci. 4C (1909) 400; Merr., Enum. 3 (1923) 173.

LUZON (Sorsogon) to Biliran, Samar and Mindanao (Davao), *Cuming 1676, Williams 2862, Elmer 11627, 16064, Bur. Sci. 18830 McGregor.*

SYZYGIUM OBLIQUINERVIUM (Elm.) comb. nov.

Eugenia obliquinervia Elm., Leafl. Philip. Bot. 10 (1939) 3768, descr. angl.

Arbor glabra, circiter 18 m. alta, ramis ramulisque teretibus, pallidis, ultimis circiter 1.5 mm. diametro; foliis subcoriaceis, oppositis, distincte petiolatis (petiolo 1.5 cm. longo), oblongis, oblongo-oblanceolatis vel subellipticis, 8–13 cm. longis, 3–5 cm. latis, subacutis vel breviter obtuse acuminatis, basi acutis, haud puncticulatis, sicco supra atro-olivaceis, nitidis, subtus pallide brunneis; nervis primariis utrinque 4–6, subadscendentibus, subtus distinctis, elevatis, circiter ad marginem arcuato-anastomosantibus, reticulis laxis; inflorescentiis ut videtur termianlibus fide Elmer sub fructu 2–4 cm. longis (haud visis), floribus ignotis; fructibus (sicco) anguste ellipsoideis, circiter 3 x 1.8 (in vivo 3–4 x 2.5 cm. fide Elmer), rectis vel obscure inaequilateralibus, subverruculosis, obscurissime longitudinaliter striatulis, calycis tubo distincte producto 4–5 mm. diametro truncato.

The only known collection is *Elmer 16117* from Mount Bulusan, Sorsogon Province, Luzon. I do not know to which of the numerous described species it is allied, for to determine this, apparently inflorescences and flowers are essential. Perhaps its most striking character is its prominently nerved leaves, the few, distant, primary nerves distinctly ascending. The Arnold Arboretum specimen has two detached fruits in a packet, and this specimen I make the actual type as far as the above diag-

nosis is concerned; the Gray Herbarium sheet consists of a leafy branch only. But for the fact that this has been named and described by Elmer, in English, I should not have considered it until better material becomes available. It probably belongs in sect. *Jambosa*.

SYZYGIUM OLEINUM Wall.

Syzygium oleinum Wall. ex Wight, Ill. 2 (1841) 15, *nom.* in syn., et Walp., Repert. 2 (1843) 178, *nom.*

Eugenia oleina Wight, Ill. 2 (1841) 15, *nom.;* Craib Fl. Siam., Merr., Enum. 1 (1931) 653, *nom.;* Henders., Gard. Bull. Singapore 12 (1949) 150, *fig.* 29 *e-f, cum. syn.*

Eugenia myrtifolia Roxb., Hort. Bengal. (1814) 37, *nom.;* Fl. Ind. ed. 2 (1832) 490, *descr.*, non Salisb. (1796), nec Sims (1821), nec Cambess. (1829).

Syzygium myrtifolium DC., Prodr. 3 (1828) 261, *nom.;* Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 182. (Mem. Gray Herb. 4:182).

Syzygium campanulatum Korth., Nederl. Kruidk. Arch. 1 (1847) 203; Walp. Ann. 2 (1851–52) 630.

Syzygium campanellum Miq., Fl. Ind. Bat. 1[1] (1855) 451.

Eugenia acuminatissima var. *parva* Merr., Philip. Jour. Sci. 1 Suppl. (1906) 104.

Eugenia parva C. B. Rob., Philip. Jour. Sci. 4C (1909) 341; Merr., Enum. 3 (1923) 173.

Eugenia sinubanensis Elm., Leafl. Philip. Bot. 4 (1912) 1424.

Syzygium sinubanense Diels, Bot. Jahrb. 57 (1922) 411, *nom.* in nota.

This is a widely distributed species in the Philippines, and as interpreted by Henderson, it extends from Burma and Siam to the Malay Peninsula, Anamba Islands, Sumatra, and Borneo. One might argue against the propriety of accepting of the specific name that Wallich originated, for until Henderson considered the species no description seems to have been published under *Eugenia oleina* (Wall.) Wight. Wight's entry for *Eugenia myrtifolia* Roxb. and *E. oleina* Wight is:

"34 *. E. (*S.*) *Myrtifolia* Roxb. Fl. Ind. 2, P. 490). 35 *. E. (*S.*) *Oleina* (R. W.-Syzygium oleinum Wall.) These two, if distinct, are so like each other that I cannot see by what characters they can be defined, I look upon them, judging from specimens only, as identical."

Wight gave no descriptions, but in the above statement he did, as Henderson noted, associate *Syzygium oleinum* Wall., which had not been described, with *Eugenia myrtifolia* Roxb. which had been described in 1832 from material cultivated at Calcutta originating in Sumatra; yet Roxburgh's specific name was invalid in *Eugenia* when published. De Candolle's transfer of it to *Syzygium* in 1828 is also a *nomen nudum* as he gave no description, merely citing Roxburgh's *nomen nudum* of 1814 as

the source of his binomial. If the above synonymy be correct, as I think it is, *Syzygium campanulatum* Korth., type from Sumatra, is perhaps the oldest name in *Syzygium* with a clear record. *Syzygium campanellum* Miq. was based on a specimen from a tree cultivated at the Botanical Garden, Buitenzorg, Java, and it may rather safely be assumed that this was the earlier *S. campanulatum* Korth. which Miquel did not account for. There is an excellent specimen in the Gray Herbarium under Korthals' binomial indicated as "cult. in Hort. Bogor. Java 1851." This specimen very closely matches another sheet in the Gray Herbarium labelled *Syzygium myrtifolium* DC., taken from the cultivated tree in the Calcutta Botanical Garden which was the basis of the original Roxburgh name.

SYZYGIUM PALAWANENSE (C. B. Rob.) Merr. and Perr.

Syzygium palawanense (C. B. Rob.) Merr. and Perr., Mem. Am. Acad. Arts Sci. **18** (1939) 177. (Mem. Gray Herb. **4**:177).
Eugenia palawanensis C. B. Rob., Philip. Jour. Sci. 4C (1909) 377; Merr., Enum. **3** (1923) 173.

The type and only known Philippine collection is *For. Bur. 3503 Curran* from Palawan. Six Bornean collections represent the same species.

SYZYGIUM PALLIDUM Merr.

Syzygium pallidum Merr., Manila, Govt. Lab. Publ. **17** (1906) 17.
Eugenia perpallida Merr., Philip. Jour. Sci. **1** Suppl. (1906) 106.
Eugenia pacifica Elm., ex Merr., Enum. **3** (1923) 174, *nom.* in obs.; Elm. Leafl. Philip. Bot. **10** (1939) 3808, *nom.* "*E. pacifica* Elm. is *E. perpallida* Merr."

A widely distributed species extending from northern Luzon to Mindanao. The original specific name was invalid in *Eugenia,* this explaining the use of the binomial *Eugenia perpallida* Merr. *For. Bur. 29832 Marquez* from Negros (distributed as *E. parva* Merr.), *For. Bur. 23202 Alejandro* from Cagayan Province, Luzon, *For. Bur. 26646* Velasco from Cagayan Island, *For. Bur. 25631* Cailipan from Quezon Province, Luzon, *For. Bur. 18910 Miranda* from Basilan, *For. Bur. 29874 Canilao* from Negros, all distributed as *Eugenia* sp., and *Elmer 12548* from Sibuyan, distributed under an unpublished specific name derived from the name of the town of Magallanes, all represent this species.

SYZYGIUM PANAYENSE (Merr.) comb. nov.

Eugenia panayensis Merr., Philip. Jour. Sci. **18** (1921) 292, Enum. **3** (1923) 173.

A species still known only from the type collection, *Bur. Sci. 32470 McGregor* from Panay.

SYZYGIUM PANDURIFORME (Elm.) comb. nov.

Eugenia panduriformis Elm., Leafl. Philip. Bot. 4 (1912) 1412; Merr., Enum. 3 (1923) 173; Hulth. and Lam, Blumea 5 (1949) 218.

A species known from three Mindanao collections, Davao, *Elmer 11246* and Bukidnon, *Bur. Sci. 38613 Ramos* and *Edaño;* a recent one is *P. N. H. 10144 Sulit* also from Bukidnon. Also in the Sangi Islands, north of Celebes.

SYZYGIUM PASCASIOII (Merr.) comb. nov.

Eugenia pascasioii Merr., Philip. Jour. Sci. 18 (1921) 307, Enum. 3 (1923) 173.

Known only from the type collection from Bucas Grande, *Bur. Sci. 35057 Ramos* and *Pascasio.*

SYZYGIUM PAUCIVENIUM (C. B. Rob.) comb. nov.

Eugenia paucivenia C. B. Rob., Philip. Jour. Sci. 4C (1909) 382; Merr., Enum. 3 (1923) 174.

CAMIGUIN ISLAND (Babuyan group) and Luzon (Ilocos Norte). Other collections are *Vidal 2807* from Rizal Province, Luzon, Herb. Kew., and *Bur. Sci. 79309, 79329 Edaño* from Camiguin Island, Babuyan group, distributed from Manila as "paucinervia."

SYZYGIUM PENASII (Merr.) comb. nov.

Eugenia penasii Merr., Philip. Jour. Sci. 18 (1921) 293, Enum. 3 (1923) 178.

Known only from the type collection Calayan Island (Babuyan group between Formosa and Luzon) *For. Bur. 26703 Peñas.*

SYZYGIUM PEREGRINUM (Blume) Merr. and Perr.

Syzygium peregrinum (Blume) Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 154. (Mem. Gray Herb. 4:154).
Jambosa peregrina Blume, Mus. Bot. Lugd. Bat. 1 (1849) 92.
Eugenia tawanensis Merr., Univ. Calif. Publ. Bot. 15 (1929) 220.

SULU ARCHIPELAGO, Bengas Island, *Bur. Sci. 36317 Yates,* Oct. 1919, distributed as *Eugenia tula* Merr. Mindanao, Zamboanga Province near Kabaslan, *Ebalo 786,* Dec. 13, 1940. New to the Philippine flora. Borneo.

SYZYGIUM PHANEROPHLEBIUM (C. B. Rob.) comb. nov.

Eugenia phanerophlebia C. B. Rob., Philip. Jour. Sci. 4C (1909) 353; Merr., Enum. 3 (1823) 174.

A widely distributed species extending from northern Luzon to Mindanao, *Bur. Sci. 15340 Ramos* from Leyte and *Bur. Sci. 16622 Ramos* from Laguna Province, both distributed as *Eugenia* sp. belong here.

SYZYGIUM PHILIPPINENSE (C. B. Rob.) comb. nov.

Eugenia philippinensis C. B. Rob., Philip. Jour. Sci. 4C (1909) 378; Merr., Enum. 3 (1923) 174.

Northern Luzon to Samar and Leyte, *Merrill 2054, For. Bur. 12761 Rosenbluth,* etc.

SYZYGIUM POLISENSE sp. nov.

Arbor glabra, circiter 6 m. alta, ramis ramulisque rigidis, teretibus, ultimis brunneis vel atris, ramis pallidis; foliis crasse coriaceis, rigidis, confertis, ellipticis, utrinque late rotundatis vel basi late acutis, 3.5–7 cm. longis, 2.5–4.5 cm. latis, supra olivaceis, nitidis, subtus pallidioribus, haud puncticulatis, opacis vel obscure nitidis, margine subcartilagineis, leviter revolutis; nervis primariis utrinque circiter 8, inter se 4–8 mm. distantibus, rectis vel leviter curvatis, utrinque elevatis, in venam distinctam intramarginalem 3–6 mm. a margine confluentibus, secundariis paucis vel nulis sed reticulis utrinque distinctis; petiolo crasso, 1–2 mm. longo; inflorescentiis stricte terminalibus, 3–4 cm. longis latisque, pedunculis semper 3, circiter 2 cm. longis; floribus in ramulis ultimis in triadibus confertis, sessilibus, inter minores, sub anthesin 8 mm. longis latisque; bracteis triangulari-ovatis, carinatis, acutis, subcoriaceis, quam bracteolis paullo majoribus: calycibus subinfundibuliformibus, tubo circiter 4 mm. longo, ore 4 mm. diam., lobis brevibus, late rotundatis; petalis valde imbricatis, calyptratim deciduis; stylo 5 mm. longo.

LUZON, Mountain Province (Ifugao), Mount Polis, *Phil. Nat. Herb. 7813 Celestino,* (type), May 11, 1948, in the mossy forest near the summit altitude about 2,040 m. Same locality, *Bur. Sci. 37625 Ramos* and *Edaño,* February, 1920, distributed as representing *Eugenia alvarezii* C. B. Rob. to which it is not closely allied. It is characterized by its elliptic, very coriaceous, rounded and rather prominently nerved, crowded leaves, and its small crowded flowers. In some respects it suggests *Syzygium paucivenium* (C. B. Rob.) Merr., but is not closely allied to that species.

SYZYGIUM POLYANTHUM (Wight) Walp.

Syzygium polyanthum (Wight) Walp., Repert. 2 (1843) 180; Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 155. (Mem. Gray Herb. 4:155).

Eugenia polyantha Wight, Ill. 2 (1841) 17; Henders., Gard. Bull. Singapore 12 (1949) 211, *fig. 40a.*

Eugenia balsamea sensu Ridl., Fl. Malay Penin. 1 (1922) 754, non Wight.

Eugenia junghuhniana Miq., Fl. Ind. Bat. 1[1] (1855) 441.

Eugenia nitida Duthie, in Hook. f. Fl. Brit. Ind. 2 (1878) 496, non Vell.

Eugenia atropunctata C. B. Rob., Philip. Jour. Sci. 4C (1909) 385; Merr., Enum. 3 (1923) 158. *syn. nov.*

Eugenia lambii Elm., Leafl. Philip. Bot. 4 (1912) 1430; Merr., Enum. 3 (1923) 168, *syn. nov.*

Eugenia holmani Elm., Leafl. Philip. Bot. 7 (1914) 2354, *syn. nov.*

Northern Luzon to Palawan and Mindanao, and outside of the Philippines, Burma, Siam and Indo-China through the Malay Peninsula to Sumatra, Java and Borneo.

To the synonymy as given by Henderson, Gard. Bull. Singapore 12 (1949) 211, I now add three Philippine binomials, *Eugenia atropunctata* C. B. Rob. (1908), *E. holmani* Elm. (1914), and *Eugenia lambii* Elm. (1912). A rather critical examination of numerous collections, both from the Philippines and from the extra-Philippine range of the species indicate no characters by which *Eugenia atropunctata* C. B. Rob. may be maintained. I have before me the British Museum sheet *of Cuming* 1308, the type collection of Robinson's species. *Vidal 2809, 2817* from Albay Province (herb. Kew.) belong here, as does *For. Bur. 21793 Barros* from Cagayan Province, Luzon, distributed as *Eugenia* sp. By error the type collection of *Eugenia holmani* Elm. (*Elmer 13356*) was distributed as *E. bakeri* Elm.; the latter is a synonyms of *Syzygium astronioides* (C. B. Rob.) Merr. Were Gagnepain correct in reducing *Jambolifera rezinosa* Lour. (1790) to *Eugenia polyanthum* Walp., then Loureiro's specific name would be the oldest one for this much named species. However, the plant that Loureiro described is clearly the rutaceous *Acronychia pedunculata* (Linn.) Miq.; see Merrill, Trans. Am. Philos. Soc. II. 24 2 (1935) 220. Other synonyms of *Syzygium polyanthum* Walp. are *Myrtus cymosa* Blume (1826), non Spreng., *Syzygium cymosum* Korth. (1847), non DC., *Eugenia microbotrya* Miq. (1850), *Syzygium confusum* Blume (1850), *Eugenia pamatensis* Miq. (1850), *Syzygium micranthum* Blume (1850), *Eugenia lucidula* Miq. (1850), and *Eugenia resinosa* Gagnep. (1918).

SYZYGIUM POLYCEPHALOIDES (C. B. Rob.) comb. nov.

Eugenia polycephaloides C. B. Rob., Philip. Jour. Sci. 4C (1909) 378; Merr., Enum. 3 (1923) 174.

Northern Luzon (Cagayan Province) to Samar, Leyte, and Mindanao, *Elmer 8233, 9233, 15794, Bur. Sci. 17578 Ramos*, etc.

SYZYGIUM PULGARENSE (C. B. Rob.) comb. nov.

Eugenia pulgarensis C. B. Rob., Philip. Jour. Sci. 4C (1909) 174; Merr., Enum. 3 (1923) 174.

A species known only from the type collection, *For. Bur. 3882 Curran,* from Palawan.

SYZYGIUM PURPURIFLORUM (Elm.) comb. nov.

Eugenia purpuriflora Elm., Leafl. Philip. Bot. 4 (1912) 1432; Merr., Enum. 3 (1923) 175.

Known only from Palawan from the type collections *Elmer 13117, 13233,* and *For. Bur. 21486 Fernandez.*

SYZYGIUM RAMOSII (C. B. Rob.) comb. nov.

Eugenia ramosii C. B. Rob., Philip. Jour. Sci. 4C (1909) 349; Merr., Enum. 3 (1923) 175.

A species known only from the type collection *Bur. Sci. 8030 Ramos,* from Isabela Province, Luzon.

SYZYGIUM RIGIDIFOLIUM sp. nov.

§ *Jambosae.* Ut videtur arbor parva, glabra, ramis ramulisque teretibus, rigidis, pallidis vel pallide brunneis, ultimis 2 mm. diametro; foliis stricte oppositis, sessilibus vel brevissime petiolatis, crasse coriaceis, rigidis, oblongo-ellipticis, 5–10 cm. longis, 2.5–5.5 cm. latis, apice rotundatis vel breviter acuminatis, basi late rotundatis vel obscure subcordatis, supra brunneo-olivaceis vel olivaceis, opacis, minute scrobiculato-puncticulatis, subtus pallidioribus, brunneis, obscure pustulatis vel puncticulatis, margine leviter revolutis vel planis; nervis primariis utrinque 7–8, rectis vel leviter curvatis, subadscendentibus, supra obscuris, subtus subelevatis, distinctis, inter se 6–14 mm. distantibus, in venam intramarginalem 2–3 mm. a margine confluentibus, secundariis paucis, inconspicuis, reticulis obsoletis vel subobsoletis; petiolo crasso, vix 2 mm. longo vel nullo; inflorescentiis terminalibus vel interdum axillaribus, brevissimis, paucifloris 1–3–floris, brevissime peduncalatis vel sessilibus; floribus inter majores, sessilibus vel brevissime pedicellatis, ebractolatis; calycis tubo fere 2 cm. longo sursum 1.5 cm. diametro, deorsum leviter angustato, brunneo, lobis 4, coriaceis, reniformibus, ad 5 mm. longis et 8 mm. latis; petalis maturis non visis; filamentis circitir 1 cm. longis; stylo exserto, 2 cm. longo.

LUZON, Isabela Province, Mt. Moises, *Clemens 16945,* April, 1926, type herb. Arnold Arboretum, isotypes in the Kew and the United States National herbaria.

Apparently a species belonging in the group with *Syzygium subrotundifolium* (C. B. Rob.) Merr. but with very much smaller leaves. It is characterized by its vegetative features, especially in its practically sessile leaves, its very short, few-

flowered inflorescences, and its large flowers, apparently only one flower in an inflorescence opening at a time.

SYZYGIUM RIZALENSE (Merr.) comb. nov.

Eugenia rizalensis Merr., Philip. Jour. Sci. **18** (1921) 302, Enum., **3** (1923) 175.

A species known only from the type collection, *Bur. Sci. 8030 Ramos,* from Rizal Province, Luzon.

SYZYGIUM ROBERTII Merr.

Syzygium robertii Merr., Philip. Jour. Sci. **1** Suppl. (1906) 106, Enum. **3** (1923) 176.

Eugenia succulenta Elm., Leafl. Philip. Bot. **4** (1909) 1442.

LUZON (Benguet to Quezon) Lubang and Sibuyan. Additional collections are *Bur. Sci. 23480 Ramos* from Sorsogon Province, *P. N. H. 8371 Sulit, For. Bur. 23793 Mabesa,* from Laguna Province, and *Loher 7259* from Rizal Province, Luzon.

SYZYGIUM ROBINSONII (Elm.) comb. nov.

Eugenia robinsonii Elm., Leafl. Philip. Bot. **2** (1909) 583; Merr., Enum. **3** (1923) 175.

A species known only from the type collection, *Elmer 10050,* from Negros.

SYZYGIUM ROLFEI sp. nov.

Ut videtur arbor parva, glabra, ramis ramulisque teretibus, pallidis, ultimis 1.2–2 mm. diametro; foliis praesertim subtus minute sed subdense glanduloso-puncticulatis, glandulis haud impressis, oblongo-ellipticis, 4–6 cm. longis, 2–5 cm. latis, coriaceis, opacis, supra viridibus vel olivaceo-viridibus, subtus pallidioribus, apice breviter acuminatis, basi decurrente cuneatis vel acuminatis; nervis primariis utrinque circiter 10, haud perspicuis, quam secundariis magis numerosis paullo distinctioribus, in venam intramarginalem 1.5–2 mm. a margine confluentibus; petiolo circiter 1 cm. longo; inflorescentiis lateralibus, in ramis plerumque infra foliis, 3–4 cm. longis, pedunculatis, pedunculo 1–1.5 cm longo, ramis paucis, patulis, circiter 1 cm. longis; floribus inter minores, in ramulis ultimis in triadibus dispositis, sessilibus, ramulis ultimis vix 5 mm. longis; circiter 8 mm. longis, bracteis obscuris, haud 1 mm. longis; calycis tubo 3–4 mm. diametro, cupulato, 2.5–3 mm. longo, deorsum plus minusve angustato, margine undulato-crenato, lobis 4, late rotundatis, vix 1 mm. longis; petalis imbricatis, calyptratim deciduis; filamentis 5–6 mm. longis; stylo 4–5 mm. longo.

PANAY, Leon, *Vidal 2768,* with the local name baguilumboy, type in herb. Kew.

This species is dedicated to Mr. R. A. Rolfe, who, as a young assistant at Kew, assisted Vidal in identifying the latter's large collection of Philippine plants; these Vidal collections were accessioned at Kew in March, 1886. It is well characterized by its rather densely nerved leaves although the fewer primary ones are reasonably well differentiated from the more numerous and roughly parallel secondary ones, but especially by its peduncled, relatively short inflorescences borne on the branches below the leaves.

SYZYGIUM ROSENBLUTHII (C. B. Rob.) comb. nov.

Eugenia rosenbluthii C. B. Rob., Philip. Jour. Sci. 4C (1909) 384; Merr., Enum. 3 (1923) 175.
Eugenia burebidensis Elm., Leafl. Philip. Bot. 4 (1912) 1436.

Known by three collections only, *For. Bur. 16890 Rosenbluth* from Leyte, and *Elmer 12259, 13753* from Mindanao (Davao and Agusan). It is suspected that too many species have been proposed in this particular group. *Eugenia rosenbluthii* C. B. Rob., the type collection not now available to me, should be compared with *Syzygium attenuatum* (Miq.) Merr. and Perr. as Airy Shaw has suggested. It is, however, possible that I erred in reducing *Eugenia burebidensis* Elm. to Robinson's species.

SYZYGIUM ROSEOMARGINATUM (C. B. Rob.) Merr. and Perr.

Syzygium roseomarginatum (C. B. Rob.) Merr. and Perr., Mem. Am. Acad. Arts Sci. 18 (1939) 191. (Mem. Gray Herb. 4:191).
Eugenia roseomarginata C. B. Rob., Philip. Jour. Sci. 4C (1909) 390; Merr., Enum. 3 (1923) 175.

A Luzon species extending from Ilocos Norte to Laguna Province; also in Borneo. *Bur. Sci. 22435 Ramos,* a fruiting specimen from Pampanga Province, apparently belongs here.

SYZYGIUM RUBROPURPUREUM (C. B. Rob.) Airy Shaw

Syzygium rubropurpureum (C. B. Rob.) Airy Shaw, Kew Bull. (1949) 118.
Eugenia rubropurpurea C. B. Rob., Philip. Jour. Sci. 4C (1909) 358; Merr., Enum. 3 (1923) 175.

Known from seven collections from the Zamboanga Peninsula in Mindanao and the neighboring island of Basilan, *Bur. Sci. 36766 Ramos* and *Edaño,* etc.

SYZYGIUM RUBROVENIUM (C. B. Rob.) comb. nov.

Eugenia rubrovenia C. B. Rob., Philip. Jour. Sci. 4C (1909) 358, Enum. 3 (1923) 175.
Eugenia agusanensis Elm., Leafl. Philip. Bot. 7 (1914) 2357.

A species limited to Mindanao, three collections only, *Clemens 973,990,* and *Elmer 14118* from Lanao and Agusan.

SYZYGIUM SAMARANGENSE (Blume) Merr. and Perr.

Syzygium samarangense (Blume) Merr. and Perr., Jour. Arnold Arb. **19** (1938) 115, 216; Mem. Am. Acad. Arts Sci. **18** (1939) 167. (Mem. Gray Herb. **4**:167).

Myrtus samarangensis Blume, Bijdr. (1826) 1048.

Eugenia javanica Lam., Encycl. **3** (1789) 200; Merr., Enum. **3** (1923) 168, *cum. syn.;* Henders. Gard. Bull. Singapore **12** (1949) 74, *fig. 14b,* non *Syzygium javanicum* Miq., Fl. Ind. Bat. **1**[1] (1855) 461.

Widely scattered in cultivation in the Philippines; of prehistoric introduction from Malaya. Malay Peninsula and Archipelago.

SYZYGIUM SANTOSII (Merr.) comb. nov.

Eugenia santosii Merr., Philip. Jour. Sci. **18** (1921) 294, Enum. **3** (1923) 176.

A species still known only from the higher mountains of Benguet Province, Luzon. Recent collections from Mount Pulog and Mount Pauai are *P. N. H. 4341 Celestino* and *7512, 7581 Sulit.*

SYZYGIUM SESSILILIMBUM (Merr.) comb. nov.

Eugenia sessililimba Merr., Philip. Jour. Sci. **18** (1921) 296, Enum. **3** (1923) 177.

A species still known only from the type collection, *Bur. Sci. 33242 Ramos* from Ilocos Norte Province, Luzon.

SYZYGIUM SIDERICOLUM (Merr.) comb. nov.

Eugenia similis Merr., Philip. Jour. Sci. **1** Suppl. (1906) 106, Enum. **3** (1923) 177.

A species still known only from the original two collections, *Bur. Sci. 34722, 34521 Ramos* and *Pascasio* from Surigao Province, Mindanao.

SYZYGIUM SIMILE (Merr.) comb. nov.

Eugenia similis Merr., Philip. Jour. Sci. **1** Suppl. (1906) 106, Enum. **3** (1923) 177.

Calyptranthes ramiflora Blanco, Fl. Filip. (1837) 420, non *Syzygium ramiflorum* Airy Shaw (1949).

A species of wide Philippine distribution extending from Ilocos Norte Province in Luzon to Mindanao.

SYZYGIUM SPECIOSISSIMUM (C. B. Rob.) comb. nov.

Eugenia speciosissima C. B. Rob., Philip. Jour. Sci. **4C** (1908) 348; Merr., Enum. **3** (1923) 177.

A species known only from high altitudes in Benguet Province, Luzon, *For. Bur. 10865 Curran, 14193 Merritt.*

SYZYGIUM SQUAMIFERUM (C. B. Rob.) comb. nov.

Eugenia squamifera C. B. Rob., Philip. Jour. Sci. 4C (1909) 373; Merr., Enum. 3 (1923) 177.

A species still known only from the type collection, *For. Bur. 8243 Curran* and *Merrit*, from Zambales Province, Luzon.

SYZYGIUM STRIATULUM (C. B. Rob.) comb. nov.

Eugenia striatula C. B. Rob., Philip. Jour. Sci. 4C (1909) 397; Merr., Enum. 3 (1923) 177.

Eugenia neei Merr., Philip. Jour. Sci. 18 (1921) 301, Enum. 3 (1923) 172, *syn. nov.*

A Luzon species known from a number of collections from Zambales and Rizal provinces, including *Bur. Sci. 27156 Ramos*, type of *Eugenia neei* Merr. from Ilocos Norte Province, and *Bur. Sci. 48665 Edaño* from Rizal Province erroneously distributed as *Eugenia grisea* C. B. Rob. In describing *Eugenia neei* I erroneously placed it in the alliance with *Eugenia clavellata* Merr. *Vidal 1409*, Ilocos Norte, *Vidal 1412*, Zambales and *Loher 7267* (all herb. Kew.) represent this species.

SYZYGIUM SUBCAUDATUM (Merr.) comb. nov.

Eugenia subcaudata Merr., Philip. Jour. Sci. 11C (1916) 21.

Eugenia myrtillus sensu Merr., Enum. 3 (1923) 172, p.p., non Stapf.

The type of this was *Bur. Sci. 23324 Ramos* from Mount Kililibong, Sorsogon Province, Luzon; *Merrill Philip. Pl. 1796* (erroneously distributed as *Eugenia acrophila* C. B. Rob.) represents the same species. A more recent collection is *P. N. H. 7961 Sulit* from Mt. Nañgaoto, Mountain Province, Luzon, February, 1948, while *Loher 5102* (herb. Kew) from Benguet represents the same species. In my Enumeration 3 (1923) 172, I reduced this and *Eugenia ugoensis* C. B. Rob. to *Eugenia myrtillus* Stapf of Borneo, but with six individual collections from Mount Kinabalu, the type locality, before me, I am convinced that this was an error. It is closely allied to *Syzygium ugoense* (C. B. Rob.) Airy Shaw.

SYZYGIUM SUBFALCATUM (C. B. Rob.) comb. nov.

Eugenia subfalcata C. B. Rob., Philip. Jour. Sci. 4C (1909) 382; Merr., Enum. 3 (1923) 177.

A species known only from the type collection *Cuming 1049*, probably from Zambales Province, Luzon. The British Museum specimen of this collection is before me. If the locality is correct, as is probably the case, it is interesting to note that this apparently very local species occurs on a mountain range within sight of the City of Manila.

SYZYGIUM SUBFOETIDUM (C. B. Rob.) comb. nov.

Eugenia subfoetida C. B. Rob., Philip. Jour. Sci. 4C (1909) 360; Merr., Enum. 3 (1923) 178.

The type is *Bur. Sci. 685 Foxworthy* from Mount Victoria, Palawan. The species is otherwise known only from the recently collected *P. N. H. 152 Edaño* from Mount Mantalingahan, Brooke's Point, Palawan.

SYZYGIUM SUBROTUNDIFOLIUM (C. B. Rob.) comb. nov.

Eugenia subrotundifolia C. B. Rob., Philip. Jour. Sci. 4C (1909) 362; Merr., Enum. 3 (1923) 178.

Batan Islands and northern Luzon to Sorsogon and Polillo.

SYZYGIUM SUBSESSILE (C. B. Rob.) comb. nov.

Eugenia subsessilis C. B. Rob., Philip. Jour. Sci. 4C (1909) 360; Merr., Enum. 3 (1923) 178.

A species known from Negros, Mindanao, and Basilan, *Williams 2748, Bur. Sci. 15872 Fenix,* etc.

SYZYGIUM SUBSESSILIFLORUM (Merr.) comb. nov.

Eugenia subsessiliflora Merr., Philip. Jour. Sci. 10C (1915) 216, Enum., 3 (1923) 178.

Represented by several collections from Samar, Leyte, and Negros, *Merrill Philip. Pl. 1679, Wenzel 942, For. Bur. 23658* Roque.

SYZYGIUM SULCISTYLUM (C. B. Rob.) comb. nov.

Eugenia sulcistyla C. B. Rob., Philip. Jour. Sci. 4C (1909) 368; Merr., Enum. 3 (1923) 178.

Represented by two collections only from Abra and Benguet, *For. Bur. 15873 Bacani, 14551 Darling.* I suspect that *Bur. Sci. 28051 Fenix* from Apayao Subprovince, northern Luzon, is a narrow leaved form of this species.

SYZYGIUM SULITII sp. nov.

Arbor glabra, circiter 5 m. alta, ramis ramulisque pallidis, teretibus, rigidis, ultimis circiter 1.5 mm. diametro; foliis numerosis, confertis crasse coriaceis, obovatis vel obovato-ellipticis, 2–4 cm. longis, 1.5–2.5 cm. latis, breviter (2–5 mm.) petiolatis, apice late rotundatis, basi acutis, margine cartilagineis, supra olivaceis, obscure nitidis, minute scrobiculato-puncticulatis, subtus pallide brunneis, plus minusve punctatis, nervis utrinque numerosis, subaequalibus, parallelis, patulis, inter se haud 1 mm. distantibus; inflorescentiis stricte terminalibus, confertis, 1–2 cm. longis, breviter (5 mm.) pedunculatis vel sessilibus et e basi ramosis, 1–2 cm. diametro, bracteis oblongis, obtusis, coriaceis, 4 mm. longis, bracteolis paullo minoribus; floribus in ramulis lateralibus plerumque 1-floris, in terminalibus plerum-

que in triadabus dispositis, sessilibus vel breviter crasse pedicellatis, calycis tubo circiter 3 mm. longo, deorsum angustato, plus minusve rugoso, truncato, limbo truncato vel obscure late crenato, circiter 3.5 mm. diametro; petalis 4, suborbicularis, circiter 3 mm. diametro, valde inbricatis, plus minusve adhaerens, calyptratim deciduis; filamentis numerosis, ad 3 mm. longis, inflexis; stylo circiter 1.5 mm. longo.

LUZON. Mountain Province (Benguet), Mount Nañgaoto, *Philip. Nat. Herb. 7766 M. D. Sulit,* Feb. 19, 1948, in the dwarf forest at the summit, altitude about 2,700 m.

A species that in some characters suggests the Bornean *Syzygium ampullarium* (Stapf) Merr. and Perr., but there is no indication that the fruits of this new species are ampulliform. Among the Philippine species it is perhaps most closely allied to *Syzygium ugoense* (C. B. Rob.) Airy Shaw, but that species has smaller, distinctly acuminate, epunctate leaves. It is possible, because of the bract and bracteole characters, that its real alliance is with the group of *Syzygium fastigiatum* (Blume) Merr. and Perr. in spite of its very small leaves.

SYZYGIUM SURIGAENSE (Merr.) comb. nov.

Eugenia surigaensis Merr., Philip. Jour. Sci. 18 (1921) 297, Enum. 3 (1923) 178.

A species known only from the type collection, *Bur. Sci. 34686 Ramos* and *Pascasio,* from Surigao Province, Mindanao.

SYZYGIUM TAYABENSE (Quis. and Merr.) comb. nov.

Eugenia tayabensis Merr. and Quis., Philip. Jour Sci. 37 (1928) 175.

A species known only from the type collection, *Bur. Sci. 45691 Ramos* and *Edaño.,* from (Quezon) Tayabas Province, Luzon.

SYZYGIUM TAYTAYENSE (Merr.) comb. nov.

Eugenia taytayensis Merr., Philip. Jour. Sci. 10C (1915) 223, Enum. 3 (1923) 178.

The type collection is *Merrill 9201* from Palawan. A second Palawan collection is *For. Bur. 27919 Cenabre, Paras* and *Gellidon,* February, 1920, distributed as a new species of *Eugenia* under an unpublished binomial derived from the name of the first of the three collectors.

SYZYGIUM TENUIPES (Merr.) comb. nov.

Eugenia tenuipes Merr., Philip. Jour. Sci. 7C (1912) 316, Enum. 3 (1923) 178.

A species known from several collections from Cagayan Province, Luzon, and Mindoro. Referable is *Bur. Sci. 20155 McGregor* from Nueva Vizcaya Province, *Bur. Sci. 22438 Ramos*

from Pampanga Province, distributed as *Eugenia* sp., and *Bur. Sci. 41997 Ramos* from Rizal Province, Luzon.

SYZYGIUM TENUIRAME (Miq.) comb. nov.

Jambosa tenuiramis Miq., Fl. Ind. Bat. 1[1] (1855) 437.
Eugenia longicauda Ridl., Jour. Straits Br. Roy. As. Soc. **6** (1912) 7.
Eugenia nitidissima Merr., Philip. Jour. Sci. **10C** (1915) 213, Enum. **3** (1923) 172.
Eugenia spicata Lam. var. *tenuiramis* Henders., Gard. Bull. Singapore **12** (1949) 252.

This species is recorded from within the Philippines as (*Eugenia nitidissima* Merr.) from Leyte, Negros, Panay, and Mindanao, the type of my species being *Wenzel 922* from Leyte. Two additional collections are *Bur. Sci. 84014, 84064, Ramos* and *Convocar* from Biliran. Henderson gave its distribution as Sumatra, Malay Peninsula, and the Philippines, but, like myself, he did not see Miquel's type which was a Junghuhn specimen from Tapanoeli, Sumatra; but he did see the Teysmann coastal collection from Siboga, referred to this species by Miquel, op. cit. Suppl. (1862) 311. He notes that typical *Eugenia spicata* Lam. = *Syzygium zeylanicum* (Linn.) DC. is a low altitude coastal species in Malaysia, which does not occur in the Philippines, and that *Eugenia longicauda* Ridl. in the Malay Peninsula occurs inland at altitudes from 1,600 to 5,000 feet, while the Philippine *Eugenia nitidissima* Merr. is also an inland species occurring at altitude from 300 to 900 m. Miquel's description indicates the leaves of his species as very long attenuate-caudate, 2 to 2¾ inches long and 2½ to 4 lines wide, and his description otherwise agrees very closely with the Philippine form. However, I have seen no Bornean specimens that I can refer to Miquel's species as it is at present understood, and for the present prefer to retain the form as of specific rank, rather than to treat it as a variety of *Eugenia* Lam. = *Syzygium zeylanicum* (Linn.) Merr. and Perr. as Henderson did. The apparent absence of the species from Borneo is puzzling.

SYZYGIUM TOPPINGII (Elm.) comb. nov.

Eugenia toppingii Elm., Leafl. Philip. Bot. **4** (1912) 1407; Merr., Enum. **3** (1923) 178.
Eugenia puncticulata Merr., Philip. Jour. Sci. **9C** (1914) 381.

A species known from Leyte and Mindanao; *Elmer 11181, Wensel 369, 384* to be compared with *S. balerense* (C. B. Rob.) Merr.

SYZYGIUM TRIANTHUM (Merr.) comb. nov.

Eugenia triantha Merr., Philip. Jour. Sci. **10C** (1915) 224, Enum. **3** (1923) 178.

A species known from two collections from Mindanao (Butuan) and Basilan, *For. Bur. 20558 Miranda, 26417 Tecson.*

SYZYGIUM TRIPHYLLUM (C. B. Rob.) comb. nov.

Eugenia triphylla C. B. Rob., Philip. Jour. Sci. 4C (1909) 371; Merr., Enum. 3 (1923) 179.

A species known only from several collections from Mindanao (Zamboanga, Lanao) and Basilan. A recent collection is *Ebalo 832* from Zamboanga. A very unusual character of this species is that its leaves are in whorls of three, not opposite.

SYZYGIUM TRIPINNATUM (Blanco) comb. nov.

Myrtus tripinnata Blanco, Fl. Filip. (1837) 421.
Myrtus subrubens Blanco, op. cit. ed. 2 (1845) 294.
Eugenia tripinnata C. B. Rob., Philip. Jour. Sci. 4C (1909) 357; Merr., Enum. 3 (1923) 179.
Eugenia peninsula [*ris*] Elm., Leafl. Philip. Bot. 10 (1939) 3769 decr. angle, *syn. nov.*

One of the most widely distributed Philippine species, amply represented by numerous collections, extending from northern Luzon to southern Mindanao. After a critical examination of eight sheets representing the four numbers on which *Eugenia peninsula* [*ris*] Elm. was based (*Elmer 15421, 15441, 15968, 15991*) I can detect no characters by which it can be distinguished from the species Blanco characterized in 1837. All of these Elmer specimens are unsatisfactory, as the inflorescences and infructescences are represented by detached fragments, but both flowers and fruits are present; it is of course possible that two species may be represented by the cited numbers. Elmer described this as *Eugenia "peninsula"* when he should have used the form *peninsularis,* as the name was derived from the Sorsogon Peninsula, the most southern part of Luzon.

SYZYGIUM TULA (Merr.) comb. nov.

Eugenia tula Merr., Philip. Jour. Sci. 18 (1921) 297, Enum. 3 (1923) 179.

The type collection was *For. Bur. 27540 De Mesa,* from Davao Province, Mindanao. Additional collections are *For. Bur. 21889 Villamil* from Zamboanga, *25690 Tecson* from Basilan (erroneously distributed as *Eugenia bordenii* Merr.), and the recently collected *Ebalo 562* from Palawan, and *P. N. H. 10361 Mendoza* and *Convocar* from Surigao.

SYZYGIUM UGOENSE (C. B. Rob.) Airy Shaw

Syzygium ugoense (C. B. Rob.) Airy Shaw, Kew Bull. (1949) 120.
Eugenia ugoensis C. B. Rob., Philip. Jour. Sci. 4C (1909) 389.
Eugenia myrtillus sensu, Merr., Enum. 3 (1923) 172, non Staf.

This species was based on three collections from Mount Ugo, Benguet Province, Luzon, and has not appeared in recent collections. I had erroneously reduced it to the Bornean *Syzygium myrtillus* (Stapf) Merr. and Perr. of Borneo, but defer to Airy Shaw's judgment who had the opportunity of examining Stapf's type at Kew.

SYZYGIUM URDANETENSE (Elm.) comb. nov.

Eugenia urdanatensis Elm., Leafl. Philip. Bot. 7 (1914) 2365; Merr., Enum. 3 (1923) 179.

Eugenia caudatifolia Merr., Philip. Jour. Sci. 10C (1915) 211, Enum. 3 (1923) 162, *syn. nov.*

Eugenia capizensis Merr., op. cit. 18 (1921) 305, Enum. 3 (1923) 161, *syn. nov.*

With ample material representing the three supposedly distinct species I now see no valid reason for recognizing more than one, and accordingly reduce *Eugenia capizensis* Merr. and *E. caudatifolia* Merr. as synonyms of Elmer's earlier described species. Additional collections are *Wenzel 3137* from Surigao Province, Mindanao, *Bur. Sci. 84045 Ramos* and *Convocar* from Dinagat, *P. N. H. 5787 Castro, 6457 Sulit* from Samar, and *P. N. H. 10621 Mendoza* and *Convocar* from Agusan. The known range is now Luzon (Quezon, Camarines), Leyte, Panay, Dinagat, Bucas Grande, Catanduanes, and northeastern Mindanao.

SYZYGIUM VACCINIFOLIUM nom. nov.

Eugenia vaccinioides Elm., Leafl. Philip. Bot. 7 (1914) 2350; Merr., Enum. 3 (1923) 179, non *Syzygium vaccinioides* Merr. and Perr. (1942).

LUZON (Quezon) and Mindanao (Agusan), the type collection being *Elmer 13760*. A new name is needed in *Syzygium* because of the Papuan *Syzygium vaccinioides* Merr. and Perr. (1942).

SYZYGIUM VALDEPUNCTATUM sp. nov.

Ut videtur arbor parva, glabra, ramis ramulisque glabris, ultimis circiter 1.5 mm. diametro, pallide brunneis; foliis stricte oppositis, oblongo-ellipticis, firmiter chartaceis, 10–14 cm. longis, 3–5–6 cm. latis, breviter obtuse acuminatis, basi acutis vel late acutis, supra subolivaceis, subtus pallide brunneis et distincte subdense glanduloso-punctatis, glandulis leviter elevatis; nervis primariis utrinque circiter 20, supra planis vel obscure elevatis, subtus elevatis, inter se 5–10 mm. distan-

tibus, quam secondariis reticulatisque paullo distinctioribus, in venam submarginalem distinctam, 1 mm. a margine distantem confluentibus; petiolo 1–2 cm. longo; inflorescentiis terminalibus, et in axillis superioribus, sub fructu 2.5–4 cm. longis, e basi ramosis, ut videtur paucifloris; floribus ignotis; fructibus maturis urceolato-globosis, sessilibus, pallide brunneis, basi latissime rotundatis, estipitatis, 5 mm. diametro, calycis tubo lato, circiter 1 mm. longo, lobis late triangularis, acutis, vix 1 mm. longis.

MINDANAO, District of Zamboanga, *For. Bur. 26144 Babaran*, July, 1916, type herb. Arnold Arboretum, isotypes at Kew and in the United States National Herbaria.

This species is manifestly allied to *Syzygium pustulatum* (Duthie) comb. nov. (*Eugenia pustulata*) Duthie in Hook. f. Fl. Brit. Ind. 2 (1878) 495, of the Malay Peninsula, but it differs in so many points that I do not hesitate to describe it as new. Henderson, Gard. Bull. Singapore 12 (1949) 188, described the fruits of Duthie's species as "oblong globose c. 1.3 cm. long . . . fringed by the 4 erect, somewhat enlarged calyx lobes." The venation of this Philippine species is very different from that of the Malay Peninsula form, as it is also from the allied *Syzygium perpuncticulatum* (Merr.) Merr. and Perr. of Borneo, which Henderson reduces to the synonymy of *Eugenia pustulata* Duthei. This is admittedly in the alliance of Duthie's species but with ample material for comparison, both from Borneo and the Malay Peninsula, I hesitate to accept this reduction of *S. perpuncticulatum* Merr. and Perr. The very strongly impressed nerves on the upper leaf surfaces of the Bornean form is strikingly different from the characters of the Malay Peninsula plant of which eight specimens are before me, for in that form the nerves are not at all or only very slightly impressed *Syzygium halophilum* (Merr.) Merr. suggests the present species in its vegetative characters but its leaves are obscurely puncticulate, and its calyces are strongly narrowed below.

SYZYGIUM VERNONIOIDES (Elm.) comb. nov.

Eugenia vernonioides Elm., Leafl. Philip. Bot. 7 (1914) 2352; Merr., Enum. 3 (1923) 179.

The type of this was *Elmer 13826* from Agusan Province, Mindanao. A second and recent collection is *P. N. H. 6803 Edaño* from Negros.

SYZYGIUM VIDALIANUM (Elm.) comb. nov.

Eugenia vidaliana Elm., Leafl. Philip. Bot. 2 (1909) 584; C. B. Rob., Philip. Jour. Sci. 4C (1909) 372; Merr., Enum. 3 (1923) 179, excl. syn. *Eugenia williamsii* C. B. Rob.

Eugenia sorsogonensis Merr., Philip. Jour. Sci. 11C (1916) 22.

A species known from Luzon (Quezon, Sorsogon). A recent collection is *P. N. H. 2684 Sulit* from Sorsogon Province, Luzon.

SYZYGIUM VULCANICUM Elm. sp. nov.

Eugenia vulcanica Elm., Leafl. Philip. Bot. 10 (1939) 3808. *nom.* pro. syn. *E. livida* Elm.

Eugenia bulusanensis Elm., op. cit. 9 (1925) 3135, *nom.* in obs., 10 (1939) 3808 *nom.* pro. syn. *E. livida* Elm.

§ *Jambosæ*. Arbor glabra, ramis ramulisque pallidis, teretibus, ultimis circiter 1 mm. diametro, interdum obscure compressis vel sulcatis, haud angulatis; foliis oppositis, coriaceis, plerumque oblongis, vel oblongo-lanceolatis vel oblongo-ellipticis 5–13 cm. longis, 1.5–4 cm. latis, utrinque subaequaliter angustatis, basi acutis, apice distincte el plerumque subobtuse acuminatis, in sicco supra olivaceis, opacis, subtus pallidioribus, epunctatis: nervis lateralibus utrinque 5–7, gracilibus, supra obscuris, subtus leviter elevatis, distantibus, leviter curvato-adscendentibus, in venam submarginalem 1.5–3.5 mm. a margine confluentibus, secundariis paucis, haud perspicuis, reticulis laxis, plerumque subobsoletis; petiolo 3–6 mm. longo; inflorescentitis ut videtur caulinis et fasciculatis, 5–7 cm. longis pedunculatis paucifloris, floribus quam in *S. mananquil* (Blanco) Merr. (*Eugenia livida* Elm.) circiter duplo majoribus, plerumque in triadibus dispositis, pedicellis superioribus 6–8 mm. longis, inferioribus (si praesente) 1.5–2 cm. longis, bracteolis ut videtur minutis, deciduis; calycibus circiter 1 cm. longis, tubo deorsum angustato, ore ad 8 mm. diam., minute et obscure glanduloso-verruculosis, lobis suborbicularis, late rotundatis, ad 5 mm. diametro, extus obscure glanduloso-verruculosis, incrassatis; petalis orbiculari-obvatis, rotundatis, liberis, epunctatis, circiter 5 mm. diametro, staminibus numerosis filamentis ad 13 mm. longis, antheris oblongis, 1.8 mm. longis; stylo circiter 1.5 cm. longo; fructibus suburceolatis, ad 2 cm. longis et 1.5 cm. diametro, tubo distincte producto et 1 cm. lato.

LUZON, Sorsogon Province, Mount Bulusan, Elmer *16997* (type, Arnold Arboretum, isotypes in the Gray Herbarium and U. S. National Herbarium), *Elmer 17318* (fruiting specimen) *15013* (in the three herbaria above listed), collected in August and September, 1916. The last two numbers were distributed as *Eugenia bulusanensis* Elm.

I have hesitated in characterizing this species because of the unsatisfactory nature of the nine specimens before me, the inflorescences and infructescences being represented by badly

broken detached fragments. Mr. Elmer's notes are lost. It is difficult to understand why he placed both *E. vulcanica* Elm. and *E. bulusanensis* Elm. as synonyms of *Eugenia livida* Elm. which is clearly the same as *E. mananquil* Blanco = *Syzygium mananquil* Merr., because of the numerous differences between the two. While no evidence of attachment of the inflorescences is available I have assumed them to be cauline and fascicled, otherwise it is scarcely possible that Mr. Elmer would have referred the specimens to *Eugenia livida* Elm. I have accepted *Eugenia vulcanica* Elm. as the source of the specific name, and the description includes the larger leaf characters of Elmer's type as well as the smaller and more crowded leaves of what he called *Eugenia bulusanensis* Elm. I am convinced that but a single species is presented by the three collections. In the type the ultimate internodes are 2 to 3 cm. long, but in the other numbers cited they usually do not exceed 1 cm. in length. I take it that the larger leaved form was perhaps growing under more favorable conditions than the form with smaller leaves.

SYZYGIUM WENZELII (Merr.) comb. nov.

Eugenia wenzelii Merr., Philip. Jour. Sci. 9C (1914) 380, Enum. 3 (1923) 180.

The type is *Wenzel 770* from Leyte. It was also recorded from Quezon Province, Luzon. Additional collections are *Bur. Sci. 23033 McGregor* from Laguna Province, Luzon and *For. Bur. 21656, 21667 Sherfeesee, Cenabre* and *Ponce* from Surigao Province, Luzon. The species is very similar to *Syzygium rhamphiphyllum* (Craib) C. E. C. Fischer of Burma, Siam and the Malay Peninsula.

SYZYGIUM WHITFORDII (Merr.) comb. nov.

Eugenia whitfordii Merr., Manila, Govt. Lab. Publ. 35 (1906) 49, Enum. 3 (1923) 180.

A species known only from Luzon (Bataan, Laguna, and Camarines Provinces.), *Whitford 468, For. Bur. 1182, Borden, Merrill Philip. Pl. 1527,* etc.

SYZYGIUM WILLIAMSII (C. B. Rob.) comb. nov.

Eugenia williamsii C. B. Rob., Philip. Jour. Sci. 4C (1909) 365.

The type is *Williams 2128* from the Zamboanga Peninsula, Mindanao. In my Enumeration 3 (1923) 179, this was erroneously reduced to *Eugenia vidaliana* Elm. The Zamboanga and Basilan numbers there cited belong with *S. williamsii* (C. B. Rob.) Merr. An additional collection is *For. Bur. 24558 Tecson* from Zamboanga.

SYZYGIUM XANTHOPHYLLUM (C. B. Rob.) comb. nov.

Eugenia xanthophylla (C. B. Rob.) Philip. Jour. Sci. 4C (1909) 370; Merr., Enum. 3 (1923) 180.

A common species extending from northern Luzon (Cagayan) to Mindanao. A recent collection is *P. N. H. 6079 Sulit* from Samar.

SYZYGIUM XIPHOPHYLLUM (Merr.) comb. nov.

Eugenia xiphophylla Merr., Philip. Jour. Sci. 18 (1921) 298, Enum. 3 (1923) 180.

A very characteristic species known only from Mindanao (Lanao, Zamboanga). *Bur. Sci. 36872, 36979 Ramos* and *Edaño,* etc.

SYZYGIUM ZAMBOANGENSE (C. B. Rob.) comb. nov.

Eugenia zamboangensis C. B. Rob., Philip. Jour. Sci. 4C (1909) 379; Merr., Enum. 3 (1923) 180.

A species limited to Mindanao (Surigao, Zamboanga), and Basilan. An additional collection is *For. Bur. 22843 Ponce* from Surigao Province, Mindanao. The number later assigned to the cited *Hallier* collection is *583.*

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STUDIES ON THE CONTROL OF FECAL-BORNE DISEASES IN NORTH CHINA

XVII. AN APPROACH TO THE QUANTITATIVE STUDY OF THE HOUSE FREQUENTING FLY POPULATION

E. THE FOOD PREFERENCES OF THE COMMON NORTH CHINA FLIES

By Ch'ing Hua Meng and Gerald F. Winfield
Of the Department of Biology, Cheeloo University, Tsinan, Shantung, China

I. INTRODUCTION

In the previous papers of this subseries dealing with the quantitative study of the house frequenting fly population (Meng and Winfield, 1941, 1941a, 1950, and 1950a) information on the distribution, density and breeding habits of the common North China flies was presented. It was shown that there is a close relationship between the rate of breeding in the available media and the number of the adult flies in the population during the different months of the fly season. The other important factor which determined the distribution of the flies in the community is their preference for food materials. Food preferences, along with reaction to light and other environmental factors, largely determine the species and the number of flies which enter houses or courtyards, for the urge to seek food and the urge to breed are the two forces which cause most of the movement of the fly population.

Not only do food preferences play an important part in determining the distribution of the house frequenting fly population but they also determine largely the extent to which flies may act as carriers of disease to human beings. The habit of many species of flies of visiting human feces and then feeding on human food is well known as the means of carrying pathogenic organisms and needs no argument. The feeding habits of the important domestic flies have been studied in more or less detail by a great many workers. Information on the food preferences of species which occur in China has been given by several authors such as Awati and Swaminanth (1920), Patton (1928 and 1930), and Lorincz and coworkers (1936). However, few observations or experiments done in China have as yet been reported. Patton (1930) reported that *Chrysomyia megacephala* is commonly seen on food stuffs, particularly on fruits, especially water melons, in North China. Because of the importance of food preferences both in determining the distribution of the fly population and as a factor in the spread of disease organisms,

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three experiments designated to test the food preferences of the common flies were carried out in Tsinan. This paper gives the report of the results obtained.

II. MATERIALS AND METHODS

The method used in determining the food preferences of the common flies was to bait standard traps with equal amounts of the different food materials being tested. These were put at equal distances from each other in a place where flies were abundant. Three such experiments were carried out. The traps were set at the composting station at Hsin Chuang where large numbers of flies were attracted by the feces and manure which were being used in the composting experiments. A total of nine different food combinations were tested in the three experiments. They were (1) decaying beef, (2) bread, sugar, and vinegar bait, (3) human feces, (4) city garbage, (5) mixed cooked foods, (6) mixed human feces and pig, horse, and cow manure (7) pig manure, (8) horse manure, and (9) cow manure,

In Experiment 1 twenty different trappings were carried out for varying lengths of time on twenty different days during August and early September of 1936 by using four materials as bait for traps. The materials used were decaying beef, bread-sugar-vinegar bait, human feces, and city garbage. Because the lengths of the trapping periods varied on the different days, the results are reported in terms of mean number of flies caught per trapping hour.

Experiment 2 was done in September and early October, 1936 and consisted of 20 trappings of exactly 8 hours each. Three types of food were used, namely, a mixture of cooked food commonly used in Tsinan, city garbage, and a mixture of human feces, and pig, horse, and cow manure. The data for this experiment are reported as the number of flies caught per 8 hours since all trapping periods were of the same duration.

Experiment 3 was done during July to September, 1937 and consisted of forty 8-hour trappings. Six different food mixtures were used, namely, mixed cooked food, city garbage, human feces, pig manure, horse manure, and cow manure. The data for this experiment are reported as flies caught per 8-hour day.

The flies attracted to each type of food material and caught in each trap were counted, identified to species, and their sex determined. When there were only few flies caught all of them were counted, otherwise a representative portion by weight was counted and identified and the total number belonging to each species calculated.

III. PRESENTATION OF DATA

The materials tested in these three experiments were of two classes, namely, foods and breeding media. The attraction exerted, therefore, was both as food and as medium for oviposition. The results obtained will be presented in two sections. The first represents the total number of flies caught when each food material was used as bait while the second represents the sexes of the flies caught. This second section will help indicate how much the breeding factor affected the catch as against food preference alone. Only the eggs and first larvae deposited in the decaying beef used in Experiment 1 were bred and the species determined. The flies bred from that material are shown in Table 1 of the preceding paper of this series (Meng and Winfield, 1950a).

The total number of flies caught in each of the three experiments were 23,602; 6,767; and 20,965 respectively. Although the number of trappings and the kinds of food used in the third experiment were twice and one and one thrid as much respectively as in Experiment 1, yet the total catch of the latter exceeded that of the former. This may have been due in part, to the difference in the numbers of flies present in the area where the experiments were done during the two seasons. It seems likely that it was also due to the much greater attractiveness of decaying beef and bread-sugar-vinegar bait combination for many flies. These materials were used in Experiment 1 but not in Experiment 3. The catch in Experiment 2 was small due to the late season and to the fact that only three kinds of baits were used.

1. THE ATTRACTIVENESS OF THE DIFFERENT FOODS TO EACH SPECIES OF FLY AS MEASURED BY THE TOTAL NUMBER CAUGHT

The mean number of the different species of flies caught per hour or per eight-hour period with the standard error of the mean for each experiment is shown in Tables 1 to 3. These tables also show the differences between the means for the different foods and the statistical test for significance. A study of these tables shows the following results for the various species.

1. *Musca vicina.*—The first experiment showed that decaying beef was less attractive to *M. vicina* than bread, sugar, and vinegar bait but the difference was not significant. Both bread-sugar-vinegar bait combination and decaying beef were signifi-

cantly more attractive than either garbage or human feces, while garbage and feces were about equally attractive. Experiment 2 showed that mixed cooked food was significantly more attractive than the mixture of fecal materials and almost significantly more attractive than garbage. Had it not been for the fact that the number of flies caught was so small because of the lateness of the season when this experiment was done, this difference would have been significant. Garbage was more attractive than the mixture of fecal materials, but the difference was not significant. The third experiment showed that mixed cooked food was significantly more attractive than any other type of material tested, with feces coming next. Both feces and garbage were significantly more attractive than the three types of animal manure which were about equally attractive.

These experiments show that *M. vicina* is attracted more by cooked food than by any of the other materials tested. It is also strongly attracted by decaying beef, garbage, and human feces while the various types of animal manure are least attractive to it. The strong attraction of food for this species undoubtedly plays an important part in causing it to be the dominant species inside the houses. It was shown in the preceding paper of this series (Meng and Winfield, 1950a) that pig manure and feces are the favorite breeding media for this species. The fact that these breeding media were much less effective in attracting flies in the three feeding experiments than was cooked food would seem to indicate that the flies which visited these traps did so primarily in order to search for food. This preference which the house entering muscas have for food and feces as their food and breeding media is the reason this species has long been considered the most important in transmitting the fecal-borne diseases.

2. *Muscina stabulans.*—The first expirement showed that decaying beef was less attractive to *Muscina stabulans* than bread-sugar-vinegar bait although the difference was not significant. Bread-sugar-vinegar bait was significantly more attractive than feces and almost significantly more attractive than garbage. Decaying beef was not significantly more attractive than either feces or garbage which were about equally attractive. Experiment 2 showed that mixed food and garbage were equally attractive while mixed food was signifiacantly more attractive than the mixture of fecal materials. Garbage was not attractive. The third experiment showed that the mixed food was significantly the most attractive material. Feces were significantly

more attractive than garbage and the different types of manure. There were no statistical differences in the attractiveness of garbage and the three types of manure although garbage seems to be the more attractive.

These experiments show that this species is very fond of cooked food, less so of decaying beef, feces, and garbage, and least attracted by animal manure. It is of interest to note that although *M. stabulans* shows about the same reaction to food and breeding materials as *M. vicina,* nevertheless, it is not nearly so common in houses. This is probably due to their difference in reaction to light; *M. stabulans* being less attracted to enter dark places than *M. vicina.*

3. *Chrysomyia megacephala.*—Experiment 1 showed that decaying beef was significantly the most attractive material for this species. Feces and bread-sugar-vinegar bait combination which were equally attractive were significantly more attractive than garbage. The second experiment seemed to show that garbage was more attractive than either mixed food or the mixture of fecal materials, although none of the differences were significant, because of the small numbers of this species trapped. The third experiment showed that mixed food and feces which were about equally attractive, were significantly more attractive than the rest of the materials tested. Garbage was significantly more attractive than the different types of manure.

These comparisons show that this species is very fond of putrefying substances with offensive odors such as decaying beef. It is next attracted to feces, bread-sugar-vinegar bait, cooked food, and garbage. Its fondness for sweet substances such as bread sugar and vinegar bait explains the common observation that this species is attracted to fruits especially water melons. The desire of this fly for food, sweet materials, and feces coupled with the fact that it breeds in liquid feces makes it the dominant fly in the courtyards during the hot summer weather in North China. The presence of large number of this fly during summer when many families sat out of doors, indicates how it may play an important part in the spread of fecal-borne diseases.

4. *Lucilia sericata.*—The first experiment showed that decaying beef was significantly the most attractive material for *L. sericata,* and that bread-sugar-vinegar bait, garbage, and feces were almost equally attractive. Experiment 2 showed that mixed food and garbage were equally attractive and that mixed food was significantly more attractive than the mixture of fecal materials. Garbage was not attractive. In the third experi-

ment feces were significantly the most attractive materials tested. Mixed food was significantly more attractive than garbage and the different types of manure. There was no significant difference between the attractiveness of garbage and the different types of manure although garbage seems the more attractive.

These comparisons show *L. sericata* is very fond of putrefying substance such as decaying beef, less so of feces, bread-sugar-vinegar bait, cooked food, and garbage, and least attracted to animal manure. That this species was attracted to decaying beef for oviposition is shown by the fact that 32.1 per cent of flies bred from the beef used in Experiment 1 belonged to this species (Meng and Winfield, 1950a, Table 1).

TABLE 1.—*Showing the mean number of flies caught per hour in traps using various food materials for bait, 20 trappings, August and September, 1936.*

Musca vicina		
Food	Mean	Sigma
B.S.V. * (Ba.)	9.80	2.90
Beef (B.)	4.20	1.26
Garbage (G.)	0.88	0.40
Feces (F.)	0.63	0.20
	D	D/σ D
Ba. vs. B.	5.60	1.77
Ba. vs. G.	8.92	*3.05*
Ba. vs. F.	9.17	*3.15*
B. vs. G.	3.32	*2.51*
B. vs. F.	3.57	*2.80*
G. vs. F.	0.25	0.56

Muscina stabulans		
Food	Mean	Sigma
Ba.	5.79	2.03
B.	2.88	0.61
F.	1.67	0.46
G.	1.58	0.64
	D	D/σ D
Ba. vs. B.	2.91	1.37
Ba. vs. F.	4.12	*2.05*
Ba. vs. G.	4.21	1.98
B. vs. F.	1.21	1.59
B. vs. G.	1.30	1.47
F. vs. G.	0.09	0.10

Chrysomyia megacephala		
Food	Mean	Sigma
B.	44.80	7.24
F.	8.61	2.66
Ba.	8.50	2.04
G.	2.95	0.94
	D	D/σ D
B. vs. F.	36.19	*4.70*
B. vs. Ba.	36.30	*4.82*
B. vs. G.	41.85	*5.73*
F. vs. Ba.	0.11	0.03
F. vs. G.	5.66	*2.05*
Ba. vs. G.	5.54	*2.46*

Lucilia sericata		
Food	Mean	Sigma
B.	10.16	2.76
G.	1.25	0.70
Ba.	1.09	0.29
F.	0.86	0.20
	D	D/σ D
B. vs. G.	8.91	*3.13*
B. vs. Ba.	9.07	*3.27*
B. vs. F.	9.30	*3.36*
G. vs. Ba.	0.15	0.20
G. vs. F.	0.39	0.53
Ba. vs. F.	0.23	0.65

Lucilia caesar		
Food	Mean	Sigma
B.	0.64	0.22
G.	0.19	0.11
F.	0.13	0.04
Ba.	0.10	0.06
	D	D/σ D
B. vs. G.	0.45	1.80
B. vs. F.	0.51	*2.27*
B. vs. Ba.	0.54	*2.32*
G. vs. F.	0.06	0.53
G. vs. Ba.	0.09	0.69
F. vs. Ba.	0.02	0.33

Sarcophaga spp.		
Food	Mean	Sigma
B.	11.30	1.31
F.	6.78	1.27
Ba.	5.64	1.12
G.	1.92	0.81
	D	D/σ D
B. vs. F.	4.52	*2.47*
B. vs. Ba.	5.67	*3.28*
B. vs. G.	9.38	*6.08*
F. vs. Ba.	1.15	0.67
F. vs. G.	4.86	*3.23*
Ba. vs. G.	3.72	*2.69*

Musca sorbens		
Food	Mean	Sigma
F.	0.69	0.27
B.	0.23	0.08
Ba.	0.17	0.06
G.	0.12	0.05
	D	D/σ D
F. vs. B.	0.46	1.64
F. vs. Ba.	0.52	1.90
F. vs. G.	0.57	*2.10*
B. vs. Ba.	0.06	0.59
B. vs. G.	0.11	1.13
Ba. vs. G.	0.05	0.63

* Bread, sugar, and vinegar bait.

TABLE 2.—*Showing the mean number of flies caught per 8-hour trapping in traps using various food materials for bait, 20 trappings, September and October, 1936.*

Musca vicina			*Muscina stabulans*			*Lucilia sericata*		
Food	Mean	Sigma	Food	Mean	Sigma	Food	Mean	Sigma
Mixed food (F.)	80.70	31.20	F.	79.10	20.77	G.	6.80	4.10
Garbage (G.)	16.85	9.72	G.	76.35	42.36	F.	5.95	1.71
Mixed feces (Fe.)	1.25	0.32	Fe.	6.85	3.65	Fe.	0.70	0.22
	D	D/σD		D	D/σD		D	D/σD
F. vs. G.	63.85	1.95	F. vs. G.	2.75	0.06	G. vs. F.	0.85	0.19
F. vs. Fe.	79.45	*2.54*	F. vs. Fe.	72.25	*3.42*	G. vs. Fe.	6.10	1.48
G. vs. Fe.	15.60	1.60	G. vs. Fe.	69.50	1.63	F. vs. Fe.	5.25	*3.05*

Chrysomyia megacephala			*Sarcophaga spp.*			*Musca sorbens*		
Food	Mean	Sigma	Food	Mean	Sigma	Food	Mean	Sigma
G.	14.25	7.07	F.	10.80	2.37	F.	2.00	0.71
F.	5.25	1.49	G.	10.10	5.44	G.	0.85	0.33
Fe.	2.95	1.04	Fe.	6.95	2.85	Fe.	0.60	0.41
	D	D/σD		D	D/σD		D	D/σD
G. vs. F.	9.00	1.24	F. vs. G.	0.70	0.11	F. vs. G.	1.15	1.46
G. vs. Fe.	11.30	1.58	F. vs. Fe.	3.85	1.03	F. vs. Fe.	1.40	1.70
F. vs. Fe.	2.30	1.26	G. vs. Fe.	3.15	0.51	G. vs. Fe.	0.25	0.40

5. *Lucilia caesar.*—The first experiment indicated that decaying beef was significantly more attractive to *L. caesar* than either bread-sugar-vinegar bait or feces and was almost significantly more attractive than garbage. Bread-sugar-vinegar bait, garbage, and feces were about equally attractive. In the second experiment so few of this species were caught that no comparisons were made. Experiment 3 showed that mixed food was significantly the most attractive material. Feces were more attractive than garbage and cow manure. Garbage was more attractive than cow manure although the difference was not significant. This species was not attracted to pig and horse manure.

These comparisons show that this species is very fond of decaying beef, less fond of cooked food, feces, bread-sugar-vinegar bait, and garbage, and least fond of animal manure.

6. *Sarcophaga.*—The first experiment showed that decaying beef was significantly the most attractive material for the species of this genus. Feces and bread-sugar-vinegar bait which were equally attractive were significantly more attractive than garbage. Experiment 2 showed no significant differences between the three materials tested although mixed food and garbage attracted more Sarcophagas than did the mixture of feces. In the third experiment feces was significantly the most attractive material. Mixed food was significantly more attractive than garbage and the different types of manure, while garbage was more attractive than the three types of manure.

These comparisons indicate that this genus was represented by species which are very fond of putrefying substances with offensive odor such as decaying beef; quite fond of substances with strong odor such as feces and bread-sugar-vinegar bait, and less attracted to cooked food, garbage and animal manure. As was the case with *L. sericata* the urge to oviposit played an important part in the attractiveness of decaying beef for the species of this genus since 65.8 per cent of the flies bred from the beef used as bait in Experiment 1 belonged to the genus *Sarcophaga.*

7. *Musca sorbens.*—In the first experiment feces was significantly more attractive to *Musca sorbens* than garbage, and almost significantly more attractive than bread, sugar and vinegar bait. There were no significant differences between decaying beef, bread-sugar-vinegar bait, and garbage. In Experiment 2 mixed food seems to be more attractive than either garbage or the mixture of fecal materials but is not so significant. The third experiment showed that feces was significantly most attractive as compared with all other materials. Cooked food was

TABLE 3.—*Showing the mean number of flies caught per 8-hour trapping in traps using various food materials for bait, 40 trappings, July to September, 1937.*

Musca vicina		
Food	Mean	Sigma
Mixed food (F.)	26.88	5.68
Feces (Fe.)	2.73	0.73
Garbage (G.)	1.60	0.59
Cow manure (C.)	0.38	0.09
Pig manure (P.)	0.33	0.15
Horse man. (H.)	0.20	0.09
	D	D/σD
F. vs. Fe.	24.15	*4.21*
F. vs. G.	25.27	*4.42*
F. vs. C.	26.50	*4.66*
F. vs. P.	26.55	*4.66*
F. vs. H.	26.67	*4.69*
Fe. vs. G.	1.12	1.19
Fe. vs. C.	2.35	*3.18*
Fe. vs. P.	2.40	*3.20*
Fe. vs. H.	2.52	*3.41*
G. vs. C.	1.22	*2.04*
G. vs. P.	1.27	*2.09*
G. vs. H.	1.40	*2.33*
C. vs. P.	0.05	0.28
C. vs. H.	0.17	1.33
P. vs. H.	0.12	0.70

Muscina stabulans		
Food	Mean	Sigma
F.	32.48	5.70
Fe.	15.93	4.24
G.	2.73	1.37
H.	0.03	0.11
C.	0.28	0.09
P.	0.23	0.09
	D	D/σD
F. vs. Fe.	16.55	*2.38*
F. vs. G.	29.75	*5.01*
F. vs. H.	32.17	*5.62*
F. vs. C.	32.20	*5.62*
F. vs. P.	32.25	*5.64*
Fe. vs. G.	13.20	*3.06*
Fe. vs. H.	15.62	*3.83*
Fe. vs. C.	15.65	*3.89*
Fe. vs. P.	15.70	*3.91*
G. vs. H.	2.42	1.40
G. vs. C.	2.40	1.41
G. vs. P.	2.50	1.46
H. vs. C.	0.02	0.03
H. vs. P.	0.07	0.10
C. vs. P.	0.05	0.07

Lucilia sericata		
Food	Mean	Sigma
Fe.	38.60	7.51
F.	11.88	2.27
G.	1.45	0.51
P.	0.13	0.05
H.	0.10	0.05
C.	0.10	0.06
	D	D/σD
Fe. vs. F.	26.72	*3.76*
Fe. vs. G.	37.15	*5.87*
Fe. vs. F.	38.47	*6.18*
Fe. vs. H.	38.50	*6.18*
Fe. vs. C.	38.50	*6.18*
F. vs. G.	10.42	*3.13*
F. vs. P.	11.75	*3.39*
F. vs. H.	11.77	*3.40*
F. vs. C.	11.77	*3.40*
G. vs. P.	1.32	1.06
G. vs. H.	1.35	1.08
G. vs. C.	1.35	1.08
P. vs. H.	0.03	0.05
P. vs. C.	0.02	0.05
H. vs. C.	0.00	0.00

Chrysomyia megacephala		
Food	Mean	Sigma
F.	118.05	24.76
Fe.	92.53	14.25
G.	14.53	6.63
C.	0.73	0.47
H.	0.38	0.13
P.	0.15	0.06

Sarcophaga spp.		
Food	Mean	Sigma
Fe.	75.55	12.19
F.	35.00	9.42
G.	4.83	1.38
C.	0.40	0.11
H.	0.23	0.10
P.	0.23	0.08

Musca sorbens		
Food	Mean	Sigma
Fe.	12.45	2.47
F.	5.93	1.97
G.	0.15	0.07
H.	0.10	0.05
P.	0.05	0.03
C.	0.03	0.03

TABLE 3.—*Showing the mean number of flies caught per 8-hour trapping in traps using various food materials for bait, 40 trappings, July to September, 1937*—Continued.

Chrysomyia megacephala

Food	Mean	Sigma
	D	D/σD
F. vs. Fe.	25.52	0.89
F. vs. G.	103.52	*4.03*
F. vs. C.	117.32	*4.73*
F. vs. H.	117.67	*4.75*
F. vs. P.	117.90	*4.76*
Fe. vs. G.	78.00	*5.96*
Fe. vs. C.	91.80	*6.44*
Fe. vs. H.	92.15	*6.46*
Fe. vs. P.	92.37	*6.48*
G. vs. C.	13.80	*2.05*
G. vs. H.	14.15	*2.13*
G. vs. P.	14.37	*2.16*
C. vs. H.	0.35	0.72
C. vs. P.	0.57	1.22
H. vs. P.	0.22	1.60

Sarcophaga spp.

Food	Mean	Sigma
	D	D/σD
Fe. vs. F.	40.55	*2.63*
Fe. vs. G.	70.72	*5.76*
Fe. vs. C.	75.15	*6.16*
Fe. vs. H.	75.32	*6.17*
Fe. vs. P.	75.32	*6.17*
F. vs. G.	30.17	*3.16*
F. vs. C.	34.60	*3.67*
F. vs. H.	34.77	*3.69*
F. vs. P.	34.77	*3.69*
G. vs. C.	4.42	*3.20*
G. vs. H.	4.60	*3.33*
G. vs. P.	4.60	*3.33*
C. vs. H.	0.17	1.10
C. vs. P.	0.17	1.34
H. vs. P.	0.00	0.00

Musca sorbens

Food	Mean	Sigma
	D	D/σD
Fe. vs. F.	6.52	*2.06*
Fe. vs. G.	12.30	*5.00*
Fe. vs. H.	12.35	*5.02*
Fe. vs. P.	12.40	*5.04*
F. vs. C.	12.42	*5.05*
F. vs. G.	5.77	*2.93*
F. vs. H.	5.82	*2.95*
F. vs. P.	5.87	*2.98*
F. vs. C.	5.90	*2.99*
G. vs. H.	0.05	0.62
G. vs. P.	0.10	1.42
G. vs. C.	0.12	1.78
H. vs. P.	0.05	1.00
H. vs. C.	0.07	1.50
P. vs. C.	0.02	0.62

Lucila caesar

Food	Mean	Sigma
F.	3.15	0.36
Fe.	1.53	0.28
G.	0.15	0.09
C.	0.03	0.03
	D	D/σD
F. vs. Fe.	1.62	*3.61*
F. vs. G.	3.00	*3.33*
F. vs. C.	3.02	*3.64*
Fe. vs. G.	1.37	*4.74*
Fe. vs. C.	1.50	*5.35*
G. vs. C.	0.12	1.38

significantly more attractive than garbage and different types of manure. There were no significant differences between the attractiveness of garbage and the different manures.

This species is very fond of feces; less so of cooked food, decaying beef, and-sugar-vinegar bait, and least attracted by garbage and manure.

2. COMPARISONS OF THE ATTRACTIVENESS OF THE DIFFERENT FOODS TO THE MALES AND FEMALES OF EACH SPECIES OF FLIES

Attention has already been called to the fact that most of the materials tested in these experiments not only may serve the flies as food but may also serve as breeding media. If the breeding factor were a dominant one it would be reasonable to expect that more females would be captured than males when breeding media were used as bait, while foods in which no oviposition normally occurs should yield the same number of the two sexes as they occur in the natural population. When the mean number of males and females caught per hour or per day in each of

the three experiments together with its standard error were calculated for each species, the following results were obtained.

In all there was a total of 80 cases for comparison of males and females for the different species attracted by the nine different materials. Of these 20 were for the two food materials, namely bread-sugar-vinegar bait and mixed cooked food, while 60 were for the seven materials which may also serve as breeding media. Of the former 17, or 85 per cent, had means for the females which were larger than they were for the males, while only 3 showed a larger catch of males. However, only 3 of the 20, all showing larger numbers of females, were significant statistically. All of the significant comparisons were for the single species *Muscina stabulans*. Of the 60 comparisons that showed differences for the breeding materials, 51 or 85 per cent, showed larger means for the females and 9 showed differences which were significant. Thus the proportion of cases which showed more females caught than males was the same for the two classes of bait as was the proportion of statistically significant differences. It, therefore, seems justifiable to conclude that such differences as were significant were not due to the difference in attraction for the females, which the breeding media might be expected to exert but must be due to other factors. This conclusion is further borne out by the fact that 7 (three with foods and four with breeding media) of the 12 significant cases occurred for the species *Muscina stabulans*, thus suggesting that in the case of this species the females in the area where the experiments were run definitely out numbered the males. This condition possibly may have arisen from a normally longer period of survival on the part of the females as compared with the males. In two of the experiments *Musca sorbens* females were taken in numbers significantly larger than were males when feces was used as a bait. This may indicate that the females of this species are differently attracted by this material. Decaying beef attracted the females of *Musca vicina, Chrysomyia megacephala,* and *Lucilia sericata* in significantly larger numbers than the males of these species. In these cases the breeding stimulus may have been significant. On the whole, however, it seems evident that the feeding stimulus was the more powerful one in causing the flies to seek these baits since the numbers of males caught in 85 per cent of the cases did not differ significantly from the numbers of females. In all experiments for all species, the animal manures were the least attractive of the materials tested.

SUMMARY

The food preferences of seven species of flies commonly found in North China were tested by three experiments in which the number of flies caught per hour (Experiment 1) or per day (Experiments 2 and 3) in traps set equidistant from each other and baited with nine types of food and breeding materials were used to measure the attractiviness of the materials tested. A total of 80 trappings each representing approximately 8 hours were made at the composting station during the summer and fall months of 1936 and 1937, in Tsinan, Shantung, China. The materials tested were (1) decaying beef, (2) bread-sugar-vinegar bait, (3) human feces, (4) city garbage, (5) mixed cooked food, (6) mixed feces and pig, horse, and cow manure, (7) pig manure, (8) horse manure, (9) cow manure. The chief findings were as follows:

1. *Musca vicina* and *Muscina stabulans* were almost identical in their food preferences as tested by this method. They were very fond of cooked food; somewhat less so of decaying beef; less still so of feces and garbage, and least attracted by animal manures.

2. *Chrysomyia megacephala, Lucilia sericata, Lucilia caesar,* and *Sarcophaga* were almost identical in their food preferences. They were very fond of decaying beef; less so of feces, bread-sugar-vinegar bait, mixed cooked food, and city garbage; and least attracted by animal manures.

3. *Musca sorbens* was most attracted by feces; less by mixed cooked food, decaying beef, and bread-sugar-vinegar bait, and least attracted by garbage and animal manure.

4. In 85 per cent of the tests there was no significant difference between the numbers of males and females caught, thus indicating that in most cases the breeding urge was not the dominant one which caused the flies to be attracted by these materials.

5. *Muscina stabulans* females were caught in numbers significantly larger than were the males in 7 out of the 12 tests, 3 of the significant tests occurring with food baits, and 4 occurring with breeding material baits. This difference was probably due to a larger number of females of this species being present in the population at the place where the tests were run.

6. The females of *Musca vicina, Chrysomyia megacephala,* and *Lucilia sericata* were more strongly attracted to decaying beef than were the males of these species, while *Musca sorbens* females were more strongly attracted to feces than were the males.

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BOOKS

Books reviewed here were received from time to time by The Philippine Journal of Science and acknowledged in this section.

Fundamentals of Organic Chemistry. By James Bryant Conant and Albert Harold Blatt. New York, The Macmillan Company, 1950. 413p. Price, $4.

The authors' mission in providing students interested in biology, medicine, agriculture and industry with the fundamentals of organic chemistry is well accomplished. Only those substances which are of importance to biologists, medical men, and industrialists are here considered.

The chief feature of the book is the simple style in which the subject matter is discussed, making it easy for beginners and the inexperienced to acquire the technical and practical information useful to them.

Since it is essential that a beginner be introduced to this complex science by slow stages the subject presentation is very logical, starting with some simple compounds and ending with more complex substances.

Every effort has been exerted in bringing up-to-date the treatment of interesting topics both in the industrial field and in biochemistry. Recent developments in the preparation of synthetic fuels and synthetic rubber are included. Exciting events which concern the general public in connection with medicine and public health are given in the discussion on the most recent drugs such as cortisone, aureomycin, and chloromycetin.

This book should be on the bookshelves of all those engaged in chemistry.—S. S. T.

Engineering Surveys: Elementary and Applied. By Harry Rubey, George Edward Lommel and Marion Wesley Tood. 2nd edition, New York, The Macmillan Company, 1950. 722, 169pp., illus. Price, $5.

The book is one of the Engineering Science Series and of the revised edition. It is, according to the authors, "a practical, up-to-date text and reference book covering material most needed by practicing engineers, adapted to modern trends in surveying instructions for all departments of engineering," and "suitable for either campus classes or surveying camp." The authors have done a creditable work on the subjects discussed.

There are thirty chapters covering important branches of engineering surveys including eleven tables and indexes. The usefulness of the book is increased by the inclusion of Engineering Astronomy and Photogrammetry, subjects which are usually treated separately.

Because of its clear exposition by using numerous data, graphs, pictures and examples to show the application of the methods involved, the book as a whole is a good reference for teachers of vocational and advanced schools teaching the subjects. Surveyors will find the book a very useful companion.—G. O. O.

Laboratory Experiments in Organic Chemistry. By Roger Adams and John R. Hohnson. 4th ed., New York, The Macmillan Company, 1949. 525p. Price, $3.25.

This manual is very practical and as a treatise for beginners the book well serves its purpose. The first part deals with the correct manipulations and methods involved in organic laboratory work. The student not only acquaints himself with the technic but also the important principles involved in the common laboratory procedures. The second part which logically follows gives the preparation and reactions of typical organic compounds.

The authors should be commended for their compilation of experiments representing important general reactions which produce good yields of pure products. Only those requiring relatively inexpensive and available materials were selected without sacrificing other desirable qualities.

Included in this edition are significant commercial developments in the field of synthetics—drugs, resins and insecticides.

The strength of all the commonly used reagents with the necessary precautions as well as the amount of chemicals needed for the experiments are listed thus providing both the student and the teacher a timesaving device.

As a guide and a handy reference for those who teach organic chemistry this book should be very useful.—S. S. T.

Legal Phases of Engineering: Contracts & Specifications. By Ivan C. Crawford. New York. The Macmillan Company, 1950. 346p. Price, $3.75.

Legal Phases of Engineering is a book that should attract the attention of engineers and engineering students, although written primarily for students. It discusses engineering topics together with "legal relations peculiar to the profession—to acquaint the student with their relations in an elementary manner." This, the author fully succeeded in his presentation.

The chapters included: Engineering and the Construction Industry, Sources of American Law, Courts, Evidence, Expert Testimony, Ethics, Contracts, Discharge of Contracts, Business Organization, Real Property, Tort, Agency, Independent Contractor, Sales, Construction Contracts, Steps Leading to the

Award of Contracts, Specifications, Insurance, and Workmen's Compensation Insurance. Forms are given in the appendices to facilitate the preparation of contracts and allied subjects.

Although based on American practices foreign engineers will find the book a good reference and guide. Teachers and professors of the subject will find more materials in the book particularly the cases. To the legal profession, the book is also recommendable.—G. O. O.

Principles of Sedimentation. By W. H. Twenhofel. New York, McGraw-Hill Book Company, Inc., 1950. 673p. illus. Price, $6.50.

This book traces the progress that has been added to the knowledge of sediments and sedimentary processes since the publication of the "Principles of Sedimentation" in 1939 by the same author. Emphasis is placed on a complete consideration of those environmental factors that have major influence in production, deposition and subsequent modification of sediments for a logical understanding of sediments and sedimentary processes.

Among the important topics discussed in this book may be mentioned the following: the environmental factors; classification of environments; origin of inorganic sediments; interrelations of organisms and sediments; transportation and deposition of sediments; classification of sediments, sedimentary rocks, and minerals of sediments; the clastic sediments; sediments of chemical deposition; structural features of sedimentary origin; textures and colors of sediments.

This book is a good reference material for students of geology. It may serve as a guide for geologists and other workers interested in that unexplored field of sedimentation.—A. O. C.

ERRATA

VOLUME 79

Page 63, line 23: Oliver, F. should read Oliver, D.

Page 250, line 14: parentheses in (Ludlow) should be deleted.

Page 251, line 9: (Theobold) should read Theobald with parentheses deleted.

Page 253, lines 7 to 8: all parentheses should be deleted.

Page 256, lines 20 to 23: all parentheses should be deleted.

Page 256, line 28: parentheses in (Doenitz) should be deleted.

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[New names and new combinations are printed in *italics*.]

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